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E. L. Demmon, Director

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USE OF LAND FOR FORESTS IN THE LOWER PIEDMONT REGION OF GEORGIA

By

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and

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This paper releases data gathered in current investigations of the Southern Forest Experiment Station, and is subject to correction or modification following further investigation.

FOREWORD

The study reported in this paper was made under an agreement signed August 15, 1933 between the Regents of the University System of Georgia and the following branches of the United States Department of Agriculture: The Bureau of Agricultural Economics, the Southern Forest Experiment Station, and the Bureau of Chemistry and Soiis. When the Division of Program Planning of the Agricultural Adjustment Administration was organized in 1933, the Land Policy Section of that Division continued the cooperation of the Bureau of Agricultural Economics.

The study was made in the Lower Piedmont Region of Georgia. Its primary purpose, as stated in the Memorandum of Agreement was:

"To determine, for the territory covered, the elements of a land utilization program, based upon a thorough study of physical conditions, present methods of utilization, and economic and social factors which tend to determine present and prospective utilization, and which should be taken into consideration in determining the adjustments requisite in a sound program of land utilization."

This report is the part contributed by the Southern Forest Experiment Station to the project. Portions of this report were published by the Georgia Agricultural Experiment Station as Chapter VI in Bulletin #191, "Georgia Land Use Problems." Because the edition of that bulletin was limited, the present report is being published in full in order to reach all those who are primarily interested in the forests.

E. L. Demmon
Director

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THE REGION

LOCATION AND DESCRIPTION

The Lower Piedmont Region of Georgia includes about 35 counties located in the central part of the State. (See figure 1). This area of about 7,254,400 acres is bounded on the east and west by the state lines of South Carolina and Alabama, and on the south by the Fall Line, a topographic demarcation between the Piedmont or foot-hills and the coastal plain, that extends approximately from Augusta through Macon to Columbus. In the north the Lower Piedmont Region may be separated arbitrarily from the Upper Piedmont Region by a line passing just south of Atlanta that extends from Hartwell to Carrollton. The Lower Piedmont Region extends into Alabama, South Carolina and North Carolina. Much of the information given in this report will apply to the region in those states as well as to Georgia.

On the whole, the Lower Piedmont is a gently rolling area, adequately drained by some streams that flow southward into the Gulf of Mexico and by others that flow southeastward into the Atlantic Ocean. Its soils, represented chiefly by the Cecil and Davidson series, are derived from ancient igneous and metamorphic formations. The average annual rainfall is about 45 or 50 inches, and the mean annual temperature for the region is between 60 and 65 degrees. An average growing season of about 8 months is conducive to the production of both agricultural and forest crops.

The Lower Piedmont Region is often described as the "old plantation section" because for many years individual land holdings have been so large that usually each owner has employed some tenants or croppers to farm his land. This system of farming still prevails today. Cotton, the principal crop and source of income, has been largely instrumental in forming the present social and economic system in this region. The population in 1930, 53 percent of which was white, numbered 495,196, or 43.6 persons per square mile. Most of these people have always been farmers, but within the last decade the textile industry has developed in the area and has encouraged an increase in population in some of the small towns. The term "old abandoned planta-

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Dr.W.A. Hartman and H.H. Wooten of the Land Policy Section, Division of Program Planning, Agricultural Adjustment Administration, who have planned and carried out the Land Utilization Project as a whole and have furnished the land use areas and tax data for this report; State Forester, B.M. Lufburrow, who assigned an assistant for field work; W.G. Wallace, District Forester, Georgia Forest Service; Professor G.L. Fuller of the University of Georgia; Mr. Hasty of the Bureau of Chemistry and Soils; A.D. Read, representing the Southern Forest Experiment Station; and W.P. David, representing the Bureau of Agricultural Economics and the Southern Forest Experiment Station.

tion section" would more accurately describe this region, for abandoned fields are ubiquitous. Old abandoned fields are now reforested to such an extent that 55.6 percent of the total area may be classed as forest area; yet more than two-thirds of the timberland has been cultivated at one time or another.

History of the Region

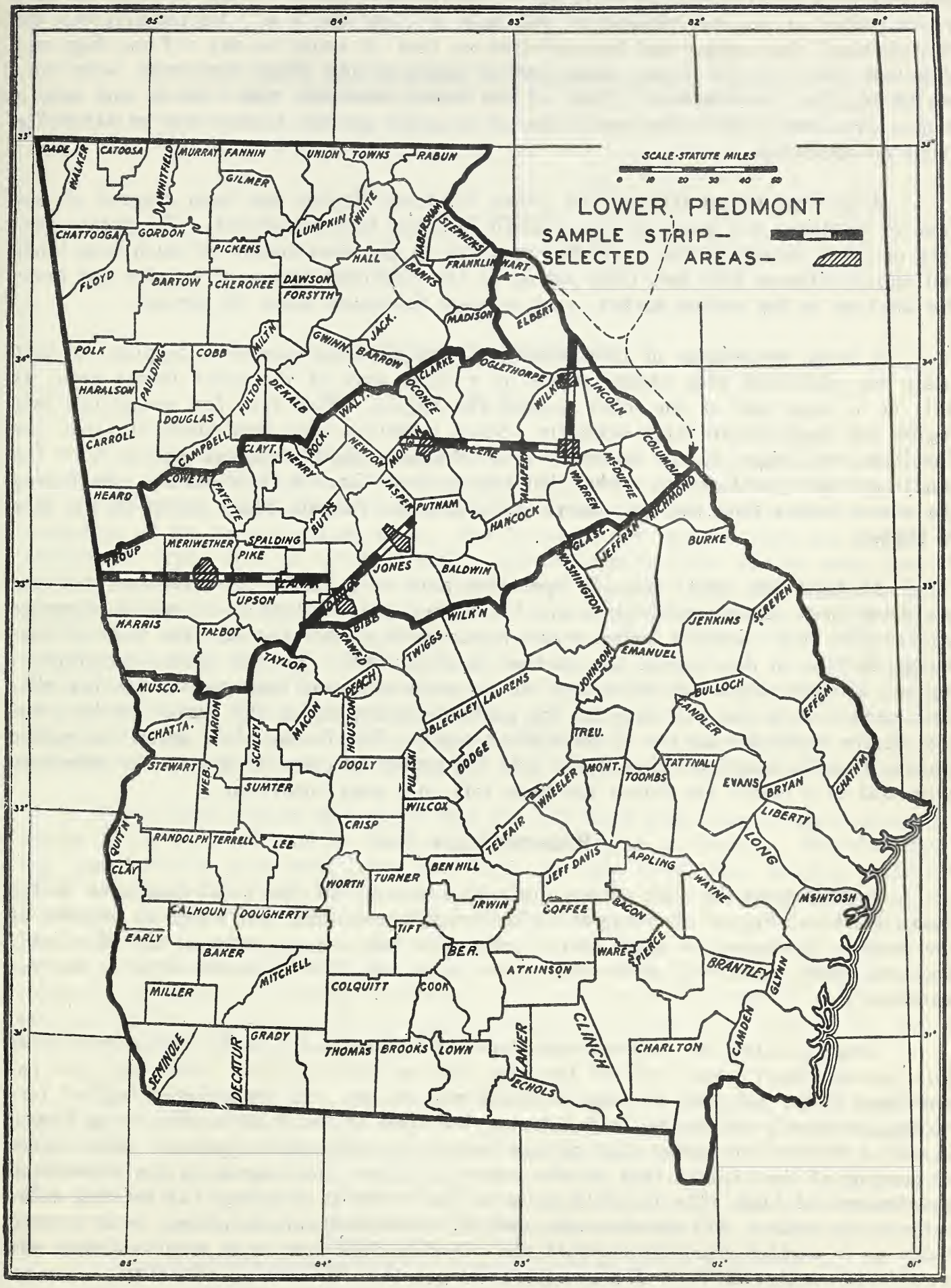
The Lower Piedmont Region of Georgia was settled during the last quarter of the eighteenth and the first quarter of the nineteenth centuries by immigrants from the older settlements of Georgia, Virginia, and the Carolinas. Prior to 1800 the region west of the Oconee River was Indian territory and settlement was limited to areas east of that river. Early in the 19th century the settlers made treaties with the Indians and the land was opened to those from Georgia by lottery, but it was also sold to immigrants who flocked in from Virginia and the Carolinas. The land was soon afterwards dotted by small farms. The first settlers cleared the rich lands on the rivers and creeks, and raised live stock, corn, and wheat. They also cleared, to some extent, the pine uplands. Cotton and tobacco were of little importance until trade received a great impetus after the war of 1812. At first the farms were held by relatively poor men with very few slaves; but as soon as an excellent market for cotton developed, the wealthy planters began to buy up the best land in large blocks and the small owners moved farther west.

Before the Civil War the Lower Piedmont Region of Georgia had become a cotton empire rivalling the coast states. A decade or two after this conflict, the region, having slowly recovered from its economic setback, again became a large factor in the production of cotton. From that time until about 1920 it remained a relatively prosperous region. Since early times, however, the wealth of the country has been concentrated in the hands of a few people. The land-owning class of pre-war days had profited from the labors of the slaves and poor whites, with the resulting contrast in standards of living exemplified by the palatial planter's home and the slave shacks or "quarters." During the Reconstruction and afterward, this social condition remained unaltered, for the land-owning class built the big homes, usually in the small towns, and rented the land to tenants and sharecroppers.

With little supervision from their town-dwelling landlords, these tenants and sharecroppers have never been careful to adopt conservative measures of cultivation. It matters little to them that the cotton plant exacts much from the soil and gives no protection from erosion during almost half the year; therefore until recently, soil cover crops and terraces were practically unknown. Old residents in the section recall days when furrows were plowed at right angles to the contours "so each furrow could drain itself", or when a mark was placed at one end of the field so that a plowman, in making his first furrow, headed directly toward his mark regardless of the topography. The light sandy soils of this region eroded so easily that many of the fields, within a few years after having been cleared, became unfit for agriculture and had to be abandoned. But land was plentiful and could be had for the cost of clearing the forest; when one field was abandoned, another area was cleared.

The boll weevil began its wholesale destruction of cotton in 1920, and until checked several years later, this pest continued to devastate entire crops. The crop loss in 1922 was so nearly complete that the financial structure of the whole region, which was directly connected with agriculture, was severely damaged. During the subsequent years of agricultural depression leading up to the present, recovery has been slow. Compared to erosion, however, which has rendered the land physically unfit for farming, the boll weevil has been but a minor factor in weakening the economic structure of the region.

FIGURE - 1



LOCATION SAMPLE STRIPS AND SELECTED AREAS IN LOWER PIEDMONT GEORGIA

When the land was first cleared for agriculture, trees were cut and burned. Old residents recall the "log rollings" of early days: social events in which farmers would gather at a given plantation and help to clear the land. Months prior to the "log-rolling" the timber had been girdled so that it would be dry. Fine, big, old shortleaf and loblolly pines, oaks, yellow poplars, and other hardwoods were cut, rolled together, and burned. Much of the forest area was thus cleared and only a minute fraction of the vast quantities of original growth timber was utilized for local construction.

More than four-fifths of the Lower Piedmont Region has been cleared at one time or another, but much of this cleared land has been abandoned. The great scarcity of labor following the Civil War resulted in the abandonment of much crop land; and again between 1919 and 1932, owing to the combined agency of erosion and post-war decline in the cotton market, crop acreage decreased about 42 percent.

A large percentage of this abandoned crop land has seeded-in to pine, so that today the old field pine timber makes up a large part of the total forest area, as well as a large part of the total area of the Region. With very few exceptions this region has never known large sawmills. Small sawmills came here about 1913 from the Carolinas and began to cut boards. They obtained their stumpage partly from the small remnant of old-growth timber, but mainly from the old field stands. Following the severe losses from the boll weevil invasion, the farmers found relief in the sale of timber.

At first the small sawmill operators paid very little for stumpage, but the world war boom encouraged high prices for lumber and resulted in increased stumpage prices. The small sawmill industry developed rapidly after the War; the peak of lumber production in this region was reached in about 1924. By 1929 lumber manufacturing had already shrunk far below that of the peak year, and today it is at a low ebb. This condition is due not only to the present depression of the lumber market, but also to the rapid diminution of the timber supply. The forest often saved the cotton planter from bankruptcy; but when he sold his timber he considered only his immediate gain--and as a result the forest has been left in a poor condition.

Present Land Use

According to the 1930 census, only 22.5 percent of the total land area in the Lower Piedmont Region of Georgia is "harvested" crop land; but about 43 percent of the Region is classed as agricultural, which includes crop, pasture, and idle land. Forested land occupies 55.6 percent of the area and urban districts make up the remainder.[1]

Large plantations with sharecroppers and tenants are still characteristic of this region, where about half of the crop land produces cotton. Cover and soil improvement crops are used on some of these plantations, and contour plowing and terracing are slowly increasing in popularity; but much of the land is still being farmed in such a destructive manner that serious erosion is everywhere apparent. Here, where 40 percent of the cleared land is idle, erosion is the chief agent in the widespread abandonment of land. The fourfold cycle of (1) woodland clearing, (2) farming without erosion control, (3) abandonment, and (4) subsequent reforestation, is as common today as in earlier eras; but most of the clearing done now is in woodland that was once field, hence the rate of abandonment is greater than that of clearing.

[1] See table 1 in the Appendix for details by counties.

Fortunately, however, abandoned land does not remain idle very long in most parts of this region. If a cultivated field adjacent to pine seed trees is abandoned, a young forest will soon reclaim the land. Given ordinary protection from fire, especially in the early stages of their growth, these young stands usually develop into forests. Over two-thirds of the present forests, occupying about 37 percent of the total area of the Lower Piedmont, are of old field origin; whereas natural forest land that has never been cleared occupies only about 18 percent of the area.

FOREST CONDITIONS

Types

Two methods of field procedure were followed in studying forest conditions of the Lower Piedmont Region. The first plan involved an intensive investigation in six sample areas, each about 16 square miles in extent, which were chosen as representative of the predominating soils. The forest on the sample areas was mapped according to type, size of trees, density, and merchantability; at the same time the soil, slope, erosion, and other characteristics of the land were also mapped. Forest classifications comparable to those mapped were sampled by taking one-fourth acre plots every one-sixteenth mile on parallel lines spaced one-half mile apart. Two sample areas were located in Wilkes County and one in each of the following: Jasper, Meriwether, Morgan, and Monroe Counties. The second field method involved the mapping of the forest types, tree sizes, density, and other data on a strip running across Georgia through the Lower Piedmont Region. This strip was one-eighth of a mile wide and 208 miles long; it was run generally in a westward direction. (See figure 1).

These field studies have shown that the old field pine type occupies about two-thirds of the forested area in the Lower Piedmont Region of Georgia. Wherever shortleaf and loblolly pine seed trees grow near an open area, they quickly restock it after abandonment. Loblolly pine is usually slightly more abundant than shortleaf. Hardwoods too, such as red gum, dogwood, elm, maple, and oak, are sometimes found in the old field type, but they are subordinate components of the stands. In cutover stands, however, hardwoods become more numerous. The old field type occurs most commonly on slopes of average steepness that lie between the tops of ridges and the more precipitous slopes to streams. Such situations were once cleared but due to sheet and gully erosion, they have since been abandoned.

The upland pine type, which includes only upland forested tracts that have never been cultivated, occupies about 10 percent of the total forest area. Included in this type are stands containing shortleaf and loblolly pines and hardwoods. Shortleaf usually predominates over loblolly in the stands, but the hardwoods may predominate over both. Hardwoods in the upland pine type include oak and hickory, with red gum, yellow poplar, dogwood, and other hardwoods sometimes in evidence. Most of the stands in this type are confined to the dry ridges and steep slopes.

The pine hardwood type represents about 11 percent of the forested area of the region. This type includes those characteristically fast-growing stands of mixed pine and hardwoods found upon second-bottom and branch-head sites. Loblolly pine is more

commonly found here than shortleaf. The hardwoods usually associated with the pines in this type are yellow poplar, red gum, oak, hickory, maple, sassafras, ash, redbud, and elm. Rarely is this type found upon land that has been cultivated, since cultivation of the precipitous slopes of the branch-head sites and of the poorly drained second-bottoms was not usually attempted.

About 11 percent of the forest land falls in the bottomland hardwood type whose stands are composed almost entirely of hardwood trees. This type, as its name implies, is confined to the bottomland of the rivers and larger creeks. A wide variation in hardwood species is found, including water oaks, gum, ash, willow, elm, maple, and hackberry. In some places this type is found on land that has been cultivated, but generally the sites are too poorly drained for agriculture.

Where the stands have not been cut and are growing upon old fields, the trees are generally even-aged, although they offer a considerable variation in diameter classes. Logged old field stands tend to become uneven-aged, for the general practice is to disregard the trees that are too small or too poor for sawlogs. Forests growing on land that has never been cultivated are uneven-aged and generally have a wide range of diameters.

Merchantability

After two decades of cutting by small sawmills, which are especially efficient in gleaning small patches of timber, only a small part of the forested area in the Lower Piedmont Region of Georgia still bears good stands of sawtimber. The one-quarter acre sample plots were classed as sawtimber if they contained a minimum volume per acre of 1,000 board feet (International one-quarter inch kerf rule) in pine trees that measured nine inches or over in diameter at breast height. Sawtimber stands of this volume are merchantable in the Region. This does not mean, however, that all plots so designated can be profitably harvested, since most of the sawtimber stands are small in area and widely scattered. About half the plots in each forest type that included pine contained 1,000 board feet or more. Table 1 shows the distribution of sawtimber plots by types for each of the six sample areas. Much of the sawtimber that has a sale value at present is in small scattered patches where logging is difficult and comparatively expensive even with small sawmills. No attempt is made to give an estimate of the total volume of timber in this region, since the available data are not sufficient to make an accurate estimate.

Density

For old field pine stands, which represent the major part of the forested area, an additional classification was made on the basis of the density of stocking. Stands were classified into three density classes: Well stocked (at least 50 percent of full stocking), medium stocked (25 to 50 percent of full stocking), and poorly stocked (less than 25 percent of full stocking). Table 1 shows the distribution of one-quarter acre plots by the three degrees of density for old field stands in the six sample areas. The plots were almost equally divided among the three density classes. Large-sized areas of well-stocked stands are not common in the Lower Piedmont Region where the forests, generally, are understocked.

The outstanding reasons why the forests in this region are poorly stocked are the inadequate number of seed trees and the prevalence of fire. Many of the abandoned fields are too remote from forested areas with seed trees. But even in the natural forest area stocking is generally low because most of the trees of seed-producing size have been logged. Much of the reproduction is killed by fire. According to the one-

quarter acre plot samples, about 14.8 percent of the forest area burned over in 1932. Fires are usually due to the negligence of brush-burners, hunters, or campers, although an occasional incendiary may deliberately fire the woods.

Erosion, too, plays its part in preventing adequate stocking. Wherever abandoned lands have eroded so badly that their fertile top soil has been washed away and gullies have been formed, even the pines may find it difficult to establish naturally a forest of adequate stocking. The moist, sandy gully bottoms are ideal seed-beds for pine, but erosion there may be so active that the pine cannot become established. Steep gully banks are difficult sites for reforestation; but wherever erosion is not too rapid and pine seed trees are located nearby, the eroded areas may be naturally reforested. New stands of this type, however, may be somewhat uneven-aged, for the better sites will be seeded first, whereas the poorer sites may not be reforested until the first trees of the new stand, together with other vegetation, have further checked the erosion.

Additional Areas Available for Forests

Other areas, in addition to the land classed as actual forest, will be available for forest growth if the better lands alone are to be used for agricultural purposes. These will include the land now lying idle and generally abandoned because of serious erosion, steep slope, or infertile soil. Forty percent of the open land in both the sample areas and the strip across the state was found to be idle, and about 70 percent of this idle land was classified as unfit for either agriculture or pasture--that is, it was suitable only for forests. Since 43 percent of the Lower Piedmont Region is cleared land, and 40 percent of the cleared land is idle, about 17 percent of the entire region is idle. If 70 percent of the idle land is suitable only for forests, then about 12 percent of the total area of the region is idle land that should be added to the present forest area (55.6 percent of the regional area) to make a total of about 68 percent of the Lower Piedmont Region in present or potential forests. In the above discussion it is assumed that all of the land now being cultivated, as well as the idle land that is suitable for cultivation or pasturage, will continue in that category. The present federal program of removing submarginal land from agriculture, however, may increase still further the 68 percent of forest area in the region.

Volumes and Growth

Stand tables, volumes, and annual growth in volume in each of the six sample areas were computed for each class of stand in each forest type. Volume in rough cords was figured for the pine trees in the diameter classes 2, 4, 6, and 8 inches, and the averages of the six sample areas show about 6 cords per acre in well stocked, 2.5 cords in medium stocked, and 1 cord in poorly stocked old field pine stands. Details for all stands are given in table 2. Volumes and volume growth for the large trees were computed differently. Since pine trees over 9 inches (d.b.h.) represent the sizes commonly utilized for lumber, their volumes were computed in board feet with the use of the International one-quarter inch kerf rule because this rule approximates the volume that can be cut out at the mill.

The importance of good stocking of the forest is forcibly brought out by the volumes and increments of three old field pine stands of different densities, which are averages for the six sample areas. These volumes and increments are as follows: Well stocked, 5,179 board feet volume, 493 board feet increment; medium stocked, 3,606 board feet volume, 338 board feet increment; and poorly stocked, 1,989 board feet volume, 164 board feet increment. Details for each stand class are given in table 3.

Table 1. - Plot distribution in forest stand classes by types in the six sample areas

Class of stand	Jasper		Monroe		Wilkes A.		Wilkes P.		Meriwether		Morgan		Average Percent
	Plots	Per-cent	Plots	Per-cent	Plots	Per-cent	Plots	Per-cent	Plots	Per-cent	Plots	Per-cent	
Old field pine type:													
Sawtimber well-stkd.	27	14.7	18	9.9	19	12.9	28	24.1	45	25.6	17	14.1	16.9
Young well-stkd.	33	17.9	20	11.0	14	9.5	22	19.0	31	17.6	32	26.4	16.9
Sawtimber med. stkd.	33	17.9	36	19.8	39	26.6	21	18.1	38	21.6	31	25.6	21.6
Young med. stkd.	35	19.0	32	17.6	19	12.9	14	12.1	22	12.5	12	9.9	14.0
Sawtimber poorly stkd.	22	12.0	25	13.7	27	18.4	16	13.8	14	7.9	15	12.4	13.0
Young poorly stkd.	34	18.5	51	28.0	29	19.7	15	12.9	26	14.8	14	11.6	17.6
	184	100.0	182	100.0	147	100.0	116	100.0	176	100.0	121	100.0	100.0
Other than old field pine:													
Sawtimber pine & hdwd.	15	53.6	8	17.8	19	55.9	12	42.9	31	75.6	23	79.3	54.2
Young pine & hdwd.	13	46.4	37	82.2	15	44.1	16	57.1	10	24.4	6	20.7	45.8
	28	100.0	45	100.0	34	100.0	28	100.0	41	100.0	29	100.0	100.0
Sawtimber up. pine	10	41.7	10	31.2	22	55.0	8	26.7	11	37.9	24	68.6	43.5
Young up. pine	14	58.3	22	68.8	18	45.0	22	73.3	18	62.1	11	31.4	56.5
	24	100.0	32	100.0	40	100.0	30	100.0	29	100.0	35	100.0	100.0
Bottom-land hdwd.	29	100.0	17	100.0	7	100.0	16	100.0	19	100.0	32	100.0	100.0
Forest-land total	265		276		228		190		265		217		

Total number of plots - 1441

FIGURE 2.

Well-stocked

Medium-stocked

Poorly-stocked

Old Field Pine Stand

Numerous mill scale studies have shown that pine trees below 13 inches (d.b.h.) are commonly cut at a financial sacrifice; hence in considering sawtimber volumes and increment for the region, this report includes only the trees over 13 inches. Volumes and increments by classes of stands were therefore computed on this basis; for the old field stands cited above they are as follows: Well stocked, 2,670 board feet volume, 265 board feet increment; medium stocked, 1,763 board feet volume, 261 board feet increment; poorly stocked, 964 board feet volume, 143 board feet increment. Details of all stands are shown in table 4.

Hardwoods are not a factor in old field stands. In the pine hardwood stands along branches in the six sample areas, the average volumes of hardwoods and pines in trees over 13 inches (d.b.h.) are 1,717 and 2,364 board feet respectively; the increments, 86 and 94 respectively. Detailed volumes and volume growth for hardwoods are given in table 5. In order to show the distribution of both pines and hardwoods by diameter classes, stand tables for the various stand classes in the Jasper sample area, taken as an example of the six sample areas, are given in tables 6 and 7. These tables show that most of the trees are below sawtimber size.

TABLE 2. -- *Volumes per acre in cords for pine trees under 9 inches, (d.b.h.)*

Class of stand	Jasper	Monroe	Wilkes A.	Wilkes P.	Meriwether	Morgan	Average volume
Old field pine:							
Sawtimber well-stkd.	4.25	5.93	5.04	7.23	5.80	6.06	5.72
Young well-stkd.	4.75	6.80	3.08	7.69	6.33	5.82	5.74
Sawtimber med.stkd.	2.25	2.46	2.68	2.56	2.15	2.60	2.46
Young med.stkd.	2.11	3.23	2.89	2.40	2.43	2.81	2.64
Sawtimber poorly stkd.	.68	.90	1.28	.95	.40	.98	.86
Young poorly stkd.	1.42	1.15	1.40	.44	1.48	.89	1.13
Other than old field pine:							
Sawtimber pine & hdwd.	1.21	0.00	.67	1.48	1.24	.87	.91
Young pine & hdwd.	1.31	.50	.20	.78	.96	.49	.71
Sawtimber up.pine	1.53	2.20	1.71	2.31	4.56	1.74	2.34
Young up.pine	.14	.44	1.14	1.42	2.18	1.08	1.07

Table 3. - Pine volumes and growth per acre for pine trees over 9", diameter breast height

Class of stand	Jasper		Monroe		Wilkes A.		Wilkes P.		Meriwether		Morgan		Average	
	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth
	Board feet[1]													
Old field pine type:														
Sawtimber well-stkd.	4735	421	4651	397	7178	377	6102	591	5391	505	3016	668	5179	493
Young well-stkd.	94	239	197	163	113	9	229	207	259	316	94	191	164	188
Sawtimber med. stkd.	3797	339	3302	295	3378	341	3959	449	3226	302	3974	305	3606	338
Young med. stkd.	116	134	154	160	227	206	110	72	187	181	0	103	132	143
Sawtimber poorly stkd.	2030	185	1882	156	1952	219	2031	94	2252	112	1788	219	1989	164
Young poorly stkd.	117	183	209	108	241	112	230	39	186	121	182	50	194	102
Other than old field pine types:														
Sawtimber pine & hdwd.	2546	127	2784	43	2735	45	3832	95	3053	141	2301	123	2875	96
Young pine & hdwd.	631	63	208	24	278	7	333	72	476	49	306	43	372	43
Sawtimber up. pine	3209	64	3029	128	3860	178	3188	140	4095	397	3514	185	3482	182
Young up. pine	85	3	163	23	291	63	251	37	143	45	346	72	213	40

1/ International 1/4" kerf rule.

Note: Annual growth takes into consideration the increase in volume of sawtimber trees, the increase due to trees growing into the minimum sawtimber diameter class and the trees lost annually due to mortality.

Table 4. - Volumes and growth per acre for pine trees over 13", diameter breast height

Class of stand	Jasper		Monroe		Wilkes A.		Wilkes P.		Meriwether		Morgan		Average	
	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth
	Board feet 1/													
Old field pine type:														
Sawtimber well-stkd.	2852	203	2189	218	3987	254	2529	432	3339	237	1123	245	2670	265
Young well-stkd.	16	5	34	4		4		22	35	15	33	8	20	10
Sawtimber med. stkd.	2186	243	1724	252	1623	226	1591	377	1780	185	1676	281	1763	261
Young med. stkd.	30	6		16	57	5	69	9		17			26	9
Sawtimber poorly stkd.	939	198	901	158	759	153	1175	59	1435	97	574	191	964	143
Young poorly stkd.	16	7	28	17	43	19	37	25	41	10	114	13	46	15
Other than old field pine type:														
Sawtimber pine & hdwd.	1805	122	2497	69	2287	77	3450	96	2274	139	1872	61	2364	94
Young pine & hdwd.	454	38	92	12	200	13	129	30	284	29	176	14	222	23
Sawtimber up. pine	2584	83	2185	94	2474	165	1625	188	3167	120	2303	181	2390	138
Young up. pine		14	71	13		26	99	13	35	4	114	16	53	14

1/ International 1/4" kerf rule.

Note: Annual growth takes into consideration the increase in volume of sawtimber trees, the increase due to trees growing into the minimum sawtimber diameter class and the trees lost annually due to mortality.

Table 5. - Volumes and growth per acre for hardwood trees over 13", diameter breast height

Class of stand	Jasper		Monroe		Wilkes A.		Wilkes P.		Meriwether		Morgan		Average	
	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth	Volume	Annual growth
	Board feet													
Sawtimber pine & hdwd.	1917	96	1577	79	2200	110	1455	73	2106	105	1045	52	1717	86
Young pine & hdwd.	1396	70	3692	185	1997	100	2461	123	2901	145	5019	251	2911	146
Sawtimber up. pine	2343	117	868	43	1103	55	910	46	778	39	326	16	1055	53
Young up. pine	3194	160	1736	87	1308	65	848	42	1199	60	300	15	1431	72
Bottom-land hdwd.	3236	162	2017	101	2544	127	756	38	996	50	1536	77	1848	92

Note: Annual growth takes into consideration the increase in volume of sawtimber trees, the increase due to trees growing into the minimum sawtimber diameter class and the trees lost annually due to mortality.

Table 6. - Stand table for the old field pine type in the Jasper county area

Diameter breast height	Sawtimber well stocked		Young well stocked		Sawtimber medium stocked		Young medium stocked		Sawtimber poorly stocked		Young poorly stocked	
	Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.
	Number of trees per acre											
2	202.22	37.04	348.48	9.09	53.33	36.36	151.43	34.86	27.27	36.36	50.59	30.00
4	77.78	15.56	184.85	4.85	29.69	24.85	75.43	8.57	5.46	9.09	27.06	9.41
6	55.56	1.48	106.66	2.42	27.88	8.48	41.71	7.43	10.00	7.27	20.58	3.53
8	28.89		19.39		18.18	.61	10.86	1.71	6.37	7.27	14.71	
10	17.03	.44	1.09	.36	11.52	.48	1.26	.11	8.18	1.45	1.53	.47
12	10.96	.44	.24	.24	11.15	.48	.23	.23	7.27	.55	.24	.59
14	6.07	.59	.12	.24	4.49	.97	.22		2.91	.36	.12	.24
16	3.26			.12	3.51	.36			1.09	.36		.35
18	2.66	.15			1.94	.73			.91	.36		.12
20	2.22				1.45	.24			.18			
22 & up	1.04				.48				.36			
Total	407.69	55.70	660.83	17.32	163.62	73.56	281.14	52.91	70.00	63.07	114.83	44.71

TABLE 7. -- *Stand table for the Jasper County area*

Diameter breast height	Pine and hardwood type				Upland pine type				Bottomland hdwd. type
	Sawtimber		Young		Sawtimber		Young		
	Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.	All classes hardwood
	Number of trees per acre								
2	24.00	118.67	16.92	109.23	32.00	76.00	11.43	62.86	132.42
4	17.33	57.34	15.39	53.84	14.00	32.00	12.86	37.15	83.45
6	21.33	33.33	18.46	36.93	22.00	26.00		31.49	50.36
8	5.33	17.34	6.16	24.62	6.00	10.00			21.38
10	5.87	6.40	1.23	4.62	2.00	4.00		5.15	5.94
12	4.80	3.20	1.23	7.99	5.20	5.60	.86	4.01	5.38
14	4.54	4.00	1.54	3.39	2.00	2.40		2.01	2.49
16	2.67	3.21	.62	2.78	1.20	2.40		1.44	3.45
18	1.33	2.40	.62	1.24	1.20	2.40		2.30	2.63
20	1.06	1.06		.93	2.00	1.20		2.00	1.68
22 & up	.53	.27		.62	1.60	3.20		4.87	2.10
Total	88.79	247.22	62.17	246.19	89.20	165.20	25.15	153.28	311.28

A few of the 1,441 sample plots taken on the strip survey show excellent volume and yield, although nothing has been done consciously to assist this growth. Twenty of these natural stands of optimum condition and productivity may give some idea of the maximum yields that can be expected. Possibly these stands, which were found on only a minute portion of the area, were growing upon only the very best sites; but since they are natural stands, it may well be possible to grow forests somewhat comparable to them if careful forest management is practiced upon average sites. The best one-quarter acre plot had a volume of 47,704 board feet per acre at 77 years from seed, and the average of the 20 optimum plots had 20,382 board feet per acre in trees over 13 inches (d.b.h.) at 65 years. Unless the general poor quality of the material is considered, however, all sawtimber volume and growth figures for this region may be misleading. Excessively limby trees and other trees of poor quality are included in these figures because they are utilized in this region for boards, the principal product. Only a very small percent of the stumpage will produce better than Number 2 common boards of the Southern Pine Association specifications.

All increments take into consideration the increase in volume of sawtimber trees, the increase due to trees growing into the minimum sawtimber diameter class, and the trees lost annually through mortality. The annual mortality of pine in each forest type by diameter classes, as found from a tally of dead trees on the one-quarter acre plots, is given in table 8. It is generally one or two percent of the total number of trees per acre. The rate of diameter growth of pine in all stand classes is quite rapid, but is especially so for old field pines up to about the 14 inch diameter class, where, probably because of density, it falls off rapidly. The rate of diameter increase is also less in the better stocked stands. A 10 inch old field pine, for example, increases in diameter during a 5 year period as follows: In well stocked stands, 2.05 inches; in medium stocked, 2.20 inches; and in poorly stocked, 2.50 inches. Diameter growth by diameter classes and by classes of stands is given in table 9.

The effect of erosion upon the growth of forests is difficult to measure. When forests reclaim eroded land, a long period of time elapses before the impoverished soil is enriched with organic material. This period is affected greatly by fire. The forest growth is further retarded until the soil is built up to a condition of fertility and good composition. Density and the many factors of site, however, are so influential in the rate of growth that it is difficult to establish the effect of erosion alone upon forest growth.

TABLE 8. -- *Annual mortality of pine in the six sample areas*

Diameter breast height	Old field pine type	Pine hardwood type	Upland pine type
Inches	---------- *Percent of number of trees per acre* ----------		
2	1.2	0.5	0.6
4	1.5	1.4	1.8
6	1.8	2.2	2.2
8	1.8	2.5	2.2
10	1.7	2.4	2.2
12	1.6	2.4	2.2
14	1.4	2.3	2.2
16	1.2	2.2	2.2
18	1.1	2.2	2.2
20	1.0	2.2	2.2
22	.9	2.2	2.2
24	.9	2.1	2.2
26	.9	2.1	2.2
28	.9	2.1	2.2
30		2.0	2.2

TABLE 9. -- *Diameter growth (wood and bark) of pine 5 year period, Jasper County sample area*

Diameter breast height	Old field loblolly pine			Old field shortleaf pine		
	Well stocked	Medium stocked	Poorly stocked	Well stocked	Medium stocked	Poorly stocked
	Inches					
2	2.55	2.80	2.80	1.50	1.65	2.00
4	2.75	2.90	3.00	1.55	1.65	2.00
6	2.70	2.70	2.90	1.40	1.65	1.85
8	2.45	2.45	2.80	1.30	1.50	1.70
10	2.05	2.20	2.50	.95	1.30	1.40
12	1.65	1.75	2.20	.75	.95	1.05
14	1.30	1.40	1.85	.65	.85	.95
16	.85	1.10	1.65	.40	.75	.75
18	.55	.85	1.40	.40	.60	.75
20	.45	.75	1.40	.40	.60	.70

Diameter breast height	Pine-hardwood type		Upland pine type	
	Loblolly pine	Shortleaf pine	Loblolly pine	Shortleaf pine
	Inches			
2	1.85	1.00	1.55	1.00
4	1.90	1.00	1.50	1.00
6	1.90	1.00	1.50	.95
8	1.90	1.00	1.45	.95
10	1.90	1.00	1.45	.95
12	1.90	1.00	1.45	.90
14	1.90	1.00	1.45	.90
16	1.90	.95	1.40	.90
18	1.85	.95	1.40	.90
20	1.75	.95	1.40	.90
22	1.65	.95	1.40	.90

FOREST INDUSTRIES

LUMBERING

Small mills have sawn nearly all the timber that has ever been cut in the Lower Piedmont Region of Georgia. Since the beginning of the World War, when many of these small sawmills began cutting, the principal product has been pine boards or "roofers", although small quantities of pine and hardwood dimension have also been cut, chiefly for local consumption. "Roofers", a trade name given to the pine boards, generally infers total millrun, which is mainly Number 2 common pine boards.

The usual lumbering set-up in this region consists of a planing mill and concentration yard, located in a town upon a main line railroad; and of several small sawmills in the woods, which cut and deliver the rough lumber to the planer. The sawmills, or "peckerwoods" as they are commonly called, are easily moved about to cut scattered tracts of timber. Both steam- and tractor-powered outfits are found. Their cut in an average day's run is from 3,000 to 10,000 feet board measure. At a steam sawmill (slightly larger than the average), cutting 7,000 feet board measure per day, eight men did the logging; eight others, the sawing; and three men, employed half time, hauled the rough lumber 14 miles to the concentration yard. Approximately one-third man-days were required at the planer per thousand feet planed and loaded on cars. A total of about 2.5 ten-hour man-days, or about 3 eight-hour days were required to produce 1,000 feet of "roofers."

The industry was active in 1929, and common wages in the sawmill were about $1.25 to $1.50 per day for common laborers, and $3.00 to $4.00 for the sawyer. "Roofers" sold for about $17.50 per thousand board feet. Second-growth pine stumpage sold for $2.50 to $3.50 per thousand board feet; virgin timber, for $5.00.

Sawmills in this section were operating less in 1932 than in any other year since the World War. "Roofers" sold at this time for an average price of about $7.50 per thousand board feet, loaded in cars; wages at the sawmills were generally 50¢ to 60¢ per ten-hour day for common labor and $1.50 for the sawyers. (At this time many farm laborers received from $5.00 to $7.00 per month, without board). Pine stumpage, on the basis of mill tally, sold for $1.00 to $2.00 per thousand board feet. At the operation previously outlined, the planing mill or concentration yard bought the timber stumpage for $1.00 per thousand board feet lumber tally; and paid $3.50 per thousand to a contractor for logging and sawing, and $1.50 per thousand for hauling the rough lumber to the planer. Total cost to the planer was $6.00, leaving $1.50 for planing, loading, and selling. This work provided jobs, but very low wages and very little profit.

As a result of the lumber industry's having adopted the Code of Fair Competition in 1933, common wages are 24¢ per hour, and Number 2 common boards have a minimum price of about $20.00 per thousand board feet at the mill. Pine stumpage is about $2.50 per thousand board feet. Since the Code became effective, wages have been raised 380 percent above the low levels existing in 1932 and the first half of 1933. Because wages and salaries account for about 44 percent of the total manufactured value of lumber and timber products for the entire southern pine industry,[1] a commensurate rise in the price of lumber was expected.

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[1] Wackerman, A.E. and Spillers, A.R. "Labor Versus Machinery. etc.", *Southern Lumberman*, 46 (1853): 21-23, June 1933.

In January 1934, 220 sawmills in the Lower Piedmont Region of Georgia were allotted production quotas under the Lumber Code. The total allotment amounted to 14,128,000 board feet. Allowing three man-days for logging and manufacturing 1,000 board feet of lumber, the cutting of this allotment would have furnished 42,384 man-days of employment per month. If the allotment had been cut at a minimum wage of $1.92 per eight-hour day (a certain percentage of the men, however, would have been employed as skilled laborers at more than minimum wages), the wages paid out would have totaled about $85,000 per month.

Fuelwood Production

Farmers sold large quantities of fuelwood in 1932 for consumption by small industries and homes. Although soft coal was cheap, many of the cotton gins, cotton-seed mills, ice plants, and other industries used wood (the local product) to help the farmers whose usual incomes were greatly depressed. One cotton-seed mill manager stated that 10 cords of wood or 6 tons of bituminous coal were required to generate power sufficient for crushing 20 tons of cotton-seed. With cordwood selling for $2.25 per cord and coal for $3.50 per ton, the cost of milling with fuelwood was only about 7½¢ greater per ton of cotton seed. About 6 bales of cotton may be ginned per cord of wood.

Cordwood in 4-foot lengths sold in 1932 for $1.50 to $2.50 per cord, an average price of $2.00 delivered in town. This price allowed 50¢ per cord for cutting, $1.25 for hauling, and 25¢ for stumpage. Fireplace wood in 1½- and 2-foot lengths sold for about $3.00; stovewood in 14-inch lengths sold for about $4.00 per cord. Approximately 1.5 man-days are required for cutting a cord of stovewood, while one man-day is needed for fireplace wood. An average of 12 cords of wood are used annually on the farms for heating and cooking purposes. A few posts and sawlogs also are cut occasionally for farm home needs.

Other Wood-using Industries

Only small quantities of wood are used for purposes other than lumber or fuel. A mill at Monticello, Georgia, manufactures bobbins and shuttles, but the raw material is shipped in from other regions. Beech, birch, and hard maple are used for bobbins, and dogwood and persimmon for shuttles. In 1929 this plant employed 45 people full time at an average wage of $2.00 per day, but in 1932 it operated only two-thirds of the time with 25 people, each of whom received about $1.25 per day.

A small volume of white and red oak stumpage in trees of merchantable size occurs in scattered tracts, usually along the branches. If this timber is sound and is 18 inches or larger in diameter, it is suitable for staves for tight cooperage. In 1932, a limited number of staves, to be used in the manufacture of barrels for beer, wine, and whiskey, were prepared in this region for the export trade. They were hand-rived by a crew of three men, who cut from 200 to 250 staves per day. Although four different sizes are made, the bolts, when dry, are usually 4½ inches wide, 2 inches thick, and 4 feet long. White oak staves sold f.o.b. for 10¢ each and red oak staves for 7¢ each; about 40 percent of this price was said to have been paid for stumpage. Great impetus has been given to the production of staves since the repeal of the Eighteenth Amendment, so that prices and wages have risen accordingly. The stumpage volume of high quality oak, however, is so small that it prevents a widespread development of the oak-stave industry in this region.

The forest resources of the region, if properly managed, could no doubt support additional wood-using industries. These industries would have to depend for some

time upon poor quality second-growth timber, but with forest management the quality and quantity could be greatly improved and increased.

FINANCIAL POSSIBILITIES OF FOREST MANAGEMENT IN PRESENT FOREST STANDS

Present Production of Forests

The preceding chapters have shown that about two-thirds of the total forest area of the Lower Piedmont Region is in old field pine stands, and that most of these stands are understocked and composed of a poor quality of timber. The same is true of other than old field stands. This deficiency of good sawtimber is owing chiefly to the fact that farmers have been forced to strip their forest lands of salable timber when farm crops have failed to yield the necessary cash requirements. The small number of wood-using industries and the small volume of lumber cut in the region at present, as compared to the very active lumber industry during the late 1920's, are the direct effects of this scarcity of sawtimber.

Forest management under these circumstances does not promise immediate profits of much consequence. In order to obtain satisfactory profits in forest management, the growing stock in large trees (17 inches and over d.b.h.) must be built up. Moreover, the quality of the timber must be improved by increasing the density of stands. Such improvements can be attained in future stands by protecting the abundant natural reproduction against fire and by limiting the cut to only the largest sawtimber trees and the poor quality trees. Hardwoods, which come in after cutting, aid materially in naturally pruning the pines and in improving the site.

Estimated Future Yields of Forests Under Management

Since it is impossible to account for the many factors that may influence volume growth, the prediction of future yields of forests under management for longer than 5 or 10 year periods, even though it be based on the most careful measurements of growth and mortality, cannot be accurate. The increment of well stocked sawtimber stands is a fair indication of what can be expected from the understocked stands after they have been built up under forest management. But even the well stocked sawtimber stands of this region are at present understocked in the large diameter classes; hence their average yearly increment of 265 board feet per acre in the six sample areas is low. The yearly increment in this class of stand in the Wilkes Pistol sample area was 432 board feet per acre. The average volume per acre of twenty of the best stocked mature timber plots taken on the line plot survey in the region was 20,383 board feet (International one-quarter inch kerf rule) in trees over 13 inches (d.b.h.) The average age of these stands was 65 years, but the present annual increment was not determined. Judging by these data, it is not unreasonable to expect average volumes of at least 10,000 board feet per acre in sawtimber trees, and annual increments of at least 500 board feet per acre after the stands have been built up under intensive sustained yield management. Such an increase in volume will materially improve the quality of the material, and these two factors will in turn greatly increase the value of the yield.

Regulated Cutting

Little thought is given at present to the growing of crops of timber in this region, where the forest has always been exploited. In planning forest management, the owner's immediate financial requirements must be considered; but the conservation of capital values should not be lost sight of. The cut must be limited to the annual growth if a sustained yield or a perpetual income from forest property is desired; and the forest growing stock must be built up to include a proper distribution of tree sizes, so that as the large, old trees are cut, smaller and younger ones grow up to take their places. Most of the stands in this region are made up chiefly of trees below sawtimber size which, if properly managed, will have a much greater annual growth, or increment, in a few years than they have now. The quality of the timber can be improved by cutting out undesirable trees; besides, the land owners need a current cash income. For these reasons, during the next 5 or 10 years it would be desirable to cut the increment of sawtimber 13 inches and over (d.b.h.), but the cut should not exceed this increment.

Numerous studies have shown that large trees not only yield more valuable forest products than small ones, but also that they cost less per unit to log and saw. It is essential that the growing stock of the present forests be built up so that financially mature trees can furnish the current yield and provide for future cuts. Along with harvest cutting of sawtimber trees, stand improvement work should be carried on to improve the growing stock. Trees not suited for future growth, such as rough trees, large over-topping trees, and thinning material, should be removed if their removal will pay for itself.

A selection system of cutting, under which groups of trees as well as single trees are removed, is suitable for both old field and natural forest stands in this region. Although stands can be cut over annually, it is usually more economical to cut once every 5 or 10 years in order to get a heavier cut per acre. Inventories almost invariably show that stands are better stocked in the small diameter classes than in the sawtimber sizes, and that natural reproduction comes in abundantly. The allowable cut of sawtimber volume depends upon stand increment. In determining this allowable cut, however, only the increment of trees over 13 inches (d.b.h.) need be considered, since these are the trees that will be removed either in the present cut or in a later one. The annual cut should not exceed the sum of the net current growth of these trees on all parts of an ownership.

In order to determine the annual growth, or increment, of the stand, it is necessary to determine the diameter growth, and then to apply this diameter growth to the trees in the stand. The volume of the present stand subtracted from the volume of the stand after one year's growth (in diameter and height) gives the volume growth for one year. The farm woodland owner or other woodland owner may require the assistance of the State Forester or the State Extension Foresters in making these calculations. If such assistance is not available, the application of the annual volume growth found and reported in this bulletin for stands similar to those under consideration may be made without serious error. The annual growth of sawtimber (trees 13 inches and over d.b.h.) found in this region amounts roughly to 10 percent of the board foot volume in old field pine stands and 5 percent in other stands. If the landowner, in determining the allowable cut, applies these percentages to the volume in his stands, and then limits the cut to high grade sawtimber trees (17 inches and over d.b.h.) and to other trees that should be removed to improve the stand, he will be handling his timber in a manner consistent with good forestry practices.

Large forest properties should be subdivided into permanent management units. The trees should be carefully selected and marked before cutting. Sufficient high quality large trees should be taken in the first cut to obtain a fair income, but the aim should be to leave the most valuable species and the best formed trees so that productivity in quantity and quality might be built up and the largest future earnings assured. The present market for stumpage utilizes poor quality field timber. When marking for sustained yield on large forest properties, a tally should be made of all trees 13 inches and larger (d.b.h.) that are to be cut, and a separate tally of those trees over 13 inches that are to remain. The first tally will make sure that the marking does not include a volume exceeding the present increment; the second tally will indicate the approximate future increment and cut. The cost of such marking and inventory runs about $0.05 per thousand board feet in fairly well stocked sawtimber stands, or about $0.20 per acre. Between 40 and 60 acres can be covered by a crew of three or four men in an eight-hour day.

Fire Protection

Fire control is one of the first requirements of forest management. The line plot surveys in the six sample areas showed that 14.8 percent of the forest land burned over in 1932. On small holdings, such as a farm woodland, fire protection may mean nothing more than constant vigilance and the prompt extinction of fire when it does occur. Large properties, however, require a carefully planned detection system of well-placed look-out towers, a well organized system of fire and telephones lines, and a thoroughly trained detection and suppression force. Intensive protection of large areas has been found to cost about $0.05 per acre per year.

Planting

While natural reproduction can be depended upon where seed trees are now present, certain areas of idle land and cut-over areas lack seed trees and therefore require planting in order to produce a forest. Approximately 40 plantations of forest trees were visited in 1933 in the Lower Piedmont Region of Georgia. The oldest loblolly pine plantation was established in the spring of 1927. After 6½ growing seasons the survival was over 95 percent; the average height, 19 feet; and the maximum height, 21 feet. Some of the trees measured 5 inches or slightly more in diameter at breast height. The oldest slash pine plantations visited were established in 1931. After 2½ growing seasons the average height of the slash pines was 2 to 4 feet; the maximum height, about 6 feet. The oldest black locust plantation was planted in 1923. On a poor site this species had a survival of 98 percent, a maximum height of 40 feet, and a maximum diameter at breast height of 6 inches.

Additional information on plantations may be obtained from the data shown in table 2 in the Appendix. In general, the following conclusions may be drawn:

1. - Loblolly and slash pines have been the most favored species for planting; but longleaf pine, black locust, yellow poplar, and red cedar are sometimes used.

2. - Plantations are generally established upon old fields, and the area in plantations of individual ownership is usually about 1 to 10 acres; some are 20 acres or larger. The planting sites are often eroded slopes upon which the soil is poor and the drainage excessive.

3. - The trees were usually set in February at 6-foot intervals in plowed furrows spaced about 8 feet apart. Spacings 6 x 6 and 6 x 7 feet were also found.

4. - The cost of establishing plantations was extremely low because the stock was furnished usually by the Georgia State College of Forestry at Athens for $1.50 to $2.50 per thousand, and most of the planting work was done by farm labor at $0.50 per day. Total cost was about $2.00 to $3.00 per acre.

5. - Survival was good in most of the plantations studied, even though some were upon poor, dry, eroded sites. The greatest survival percent was often found where the vegetation was sparse and where sheet erosion had removed much of the top soil. The fastest growth was often found in the bottom of the washes or shallow gullies, probably because greater moisture is available there than upon the slopes. Good survival but relatively poor growth were found in deep gullies and on steep slopes. Seedlings could not survive at all in the few places where erosion was most active, unless grasses and other vegation helped the trees to arrest it and protected the seedlings from washing out or silting over.

6. - Loblolly pine and black locust seem to give the most satisfactory results in planting. Mixed rather than pure plantings of these species are the more satisfactory; for in managing mixed stands, it is possible to harvest the locust for posts after 13 years, thus leaving thinned the remaining stand of pine. Insect pests attack both species: the tip moth, the pine; and the locust borer, the black locust. What little damage they caused in this region, however, was confined to pure, densely planted stands.

7. - Although this region is north of the natural range of slash pine, that species may prove excellent for planting purposes. Slash pine plantations established here to date are not yet old enough to prove the feasibility of planting that species; but after two growing seasons it was making excellent growth even upon poor, dry sites. Slash pine, yellow poplar, red cedar, and other species should not be planted in large tracts until the present plantations or subsequent small ones are old enough to demonstrate the adaptability of these species to different sites. Although no plantations of shortleaf pine were found (possibly because it is not as favored as some of the more rapidly growing species), this species is adapted to growing upon the poor sites of the region, and its hardiness makes it valuable for erosion control and for lumber or pulpwood production.

Taxes

Taxes must be paid each year whether or not the cleared land or the woodland produces an income. The assessors do not, as a rule, recognize the timber volume present in the stand. According to a study of this region made by the Bureau of Agricultural Economics of the Department of Agriculture, cultivated, idle, and forest land are assessed identically for real estate taxes. The two main factors that govern the evaluation of land are the buildings and other improvements, and the availability of good roads. The rates of assessment and taxes per acre were found to vary somewhat in different counties; they also varied as to the owner's residence and the size of his property. Table 10 shows the assessed value and taxes per acre, as obtained by the Bureau of Agricultural Economics for each of the five counties in which sample units were studied, in relation to residence of owners and to size of holdings, as well as the averages for the five counties.

This study of taxes and ownership in the Piedmont Region shows that 80 percent of the total area of the region is held by owners that reside in the county in which their land lies, or in the county adjacent thereto; that 16 percent is held by owners that reside in the state, but outside the county or adjacent county; and that 6 percent is held by owners that reside outside the state. Land belonging to residents outside

Table 10. - Assessed value and taxes per acre in five counties in the Lower Piedmont Region of Georgia

	Jasper		Monroe		Wilkes		Meriwether		Morgan		Average	
	Ass'd. value	Taxes	Ass'd. value	Taxes	Ass'd. value	Taxes	Ass'd. value	Taxes	Ass'd. value	Taxes	Ass'd. value	Taxes
	$											
Residence of owner												
County or adjoining county	3.32	.089	4.68	.119	4.74	.123	4.55	.133	6.64	.147	4.79	.122
State but outside of county or adjoining county	2.92	.075	5.04	.128	4.90	.133	4.38	.126	6.72	.149	4.79	.122
Outside of state	3.20	.085	5.08	.128	4.41	.112	5.82	.170	7.61	.169	5.22	.133
Size of property												
Acres												
2 - 49*	3.77	.115	60.54	1.532	13.01	.379	6.02	.164			16.67	.438
50 - 174	2.93	.084	4.72	.119	5.74	.155	5.14	.148	6.55	.155	5.02	.132
175 - 499	3.57	.111	4.49	.114	4.80	.127	4.81	.139	7.16	.164	4.93	.131
500 - 999	3.12	.084	4.92	.125	4.85	.129	4.81	.138	6.84	.150	4.91	.125
1000 - 1999	3.24	.081	4.44	.112	4.70	.117	4.29	.129	6.73	.149	4.68	.118
2000+	3.07	.077	4.16	.105	3.77	.100	4.37	.130	6.19	.136	4.31	.110

* Assessments in this class often include especially valuable properties, as exemplified in Monroe county.

the state is usually assessed slightly more than that of residents living on or near their properties. The study also showed the following percentages of total area falling in each size of holding:

Acres	*Percent of total area*
2 - 49	2.9
50 - 174	25.7
175 - 499	32.9
500 - 999	16.8
1,000 - 1,999	11.4
2,000 & over	10.3

Per-acre assessments for large properties seem to be a little less than those for small ones.

Financial Possibilities of Farm Woodlands

Farm woodlands in the Lower Piedmont Region contribute to the cash income from the farm; they also furnish the fuel supply for the home, and the fence posts and other wood products needed for farming. In order to show present forest conditions, increment, and financial possibilities of farm woodlands in the Lower Piedmont Region, a typical farm mapped in the Meriwether sample area has been selected. A study of size of ownership made in 1932 by the Bureau of Agricultural Economics, U. S. Department of Agriculture, revealed that the 175 to 499 acre class contained the largest acreage of farm land in this county, as well as in the whole region. The farm selected has a total area of 297 acres, of which 230 are forested and 17 are idle land, suitable for forests but not for agriculture. Cultivated land makes up 37 acres; idle land suitable for agriculture, 13 acres. The forest woodland is made up of the following classes of stands: Sawtimber old field pine, 88 acres; young old field pine, 72 acres; pine hardwood type along the branches, 32 acres; upland pine type on a ridge, 18 acres; and bottomland hardwood along the creek, 20 acres. (For definitions of types and classes of stands, see pages 5 to 7). The proportion of area in each class approximates that found in the Meriwether sample area closely enough to render the farm a good example of the sample area as a whole. The areas occupied by stands of different densities in old field stands, and by sawtimber and young stands in the pine types other than old field, could not be mapped because they are too closely intermingled. These areas on the farm were derived by applying the same proportions of each as those determined by the line plot survey on the sample unit. Table 11 shows the area of each class of stand in the farm woodland.

The merchantable pines in all types range from 13 inches to about 20 or 22 inches but the majority are in the lower diameters. Many of these trees are limby and of poor quality, especially in the old field pine stands. Pines growing with hardwoods in natural forest stands are of much better quality.

Table 11 applies volumes and annual increments found in the Meriwether sample area to the stands in the farm woodlands. This table shows a total annual increment of 22,670 board feet of pine and 5,613 board feet of hardwoods in trees over 13 inches (d.b.h.). The annual increment in well stocked old field pine sawtimber stands is 237 board feet of pine per acre, whereas that of poorly stocked old field stands is 97 board feet of pine. Sawtimber stands in the pine hardwood type have an annual volume growth per acre of 139 board feet of pine and 105 board feet of hardwood; those in the upland pine type, 120 board feet of pine and 39 board feet of hardwood. Bottomland hardwoods, from which most of the merchantable trees have been cut, are

Table 11. - Areas, volumes, and annual increment of sawtimber over 13", diameter breast height, in a farm woodland in the Meriwether sample area

Class of stand	Area	Volume				Annual increment			
		Per acre		Total		Per acre		Total	
		Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.	Pine	Hdwd.
	Acres	Board feet							
Old field pine type:									
Sawtimber well stocked	40	3,339		133,560		237		9,480	
Sawtimber medium stocked	35	1,780		62,300		185		6,475	
Sawtimber poorly stocked	13	1,435		18,655		97		1,261	
Young well stocked	27	35		945		15		405	
Young medium stocked	21					17		357	
Young poorly stocked	24	41		984		10		240	
Pine hardwood type:									
Sawtimber	24	2,274	2,106	54,576	50,544	139	105	3,336	2,520
Young	8	284	2,901	2,272	23,208	29	145	232	1,160
Upland pine type:									
Sawtimber	7	3,167	778	22,169	5,446	120	39	840	273
Young	11	35	1,199	385	13,189	4	60	44	660
Bottomland hardwoods	20		996		19,920		50		1,000
Totals	230			295,846	112,307			22,670	5,613

annually growing only 50 board feet per acre. These per-acre sawtimber volumes indicate that the growing stock is low. The maximum volume of pine, 3,339 board feet per acre, occurs in well stocked old field stands. If properly stocked, this stand should have more than double that volume of sawtimber. Virtually all stands need to be built up, especially in the larger diameters.

The total cut in this farm woodland during the next 5 years should not exceed the present annual increment. With the majority of the trees in the small diameter classes, this annual increment would thereby increase during the 5 year period, so that by holding the cut at the present increment the stand itself would increase. Moreover, in cutting this increment, as much of the cut as possible should come from poor quality trees that are not desirable for future growth. As many high quality trees as possible should be left for future cuts, but in order to obtain sufficient volume the largest trees of both high and low quality must be taken. One reason for leaving the high quality trees for a future cut is that owing to the large percentage of present sale volume in low quality lumber, no price distinction is made in favor of higher quality products. The price commonly paid for stumpage is about $2.50 for pine and $2.00 for hardwoods, measured in lumber stacked after sawing. The total value of the allowable cut of sawtimber, which equals the present increment, is therefore $56.68 for pine stumpage and $11.23 for hardwood stumpage. Table 12 gives the value of the present annual increment of sawtimber for each class of stand. This value varies from $0.59 per acre for well stocked old field pine sawtimber stands to $0.24 per acre for those that are poorly stocked. The value of the annual increment of sawtimber pine-hardwood stands is $0.35 per acre for pine stumpage and $0.21 for hardwood stumpage, a total of $0.56. In upland pine sawtimber stands, the per acre value of annual pine increment is $0.30; that of hardwood, $0.08. As volume and quality of timber improve, correspondingly these values will increase. Owners can augment their cash income by doing their own logging and by selling the logs at the roadside or at the sawmill.

The first cut of sawtimber, designed to remove 28,283 board feet of pine and hardwood, should cover one-fifth of the sawtimber areas. Where sawtimber and young stands are intermingled, however, as in the pine-hardwood and upland pine types, it will be necessary to cover one-fifth of the total area of these types. Table 13 gives the areas, volumes, and stumpage values included in this first cut of sawtimber. Each cut made annually during the succeeding four years will cover an area and remove a volume of wood about equal to those of the first cut, thus completing at the end of five years the first cutting cycle, during which all sawtimber stands will have been cut over. During several subsequent cutting cycles, approximately the same volumes will be cut from the same areas; but inasmuch as the stands are meanwhile building up, especially with more trees of sawtimber size and quality, eventually both the volume of the annual cut and the area covered can be increased. Volumes of future cuts, made each 5 years in stands that have been grown under management, should, on a per-acre basis, equal at least the 5 years' increment of present well stocked stands; these volumes will probably amount to between 2,000 and 2,500 board feet per acre.

Table 13 also shows the quantity of fence posts and fuelwood that can be cut from tops of sawtimber trees and from improvement cuttings and thinnings. The volume of fuelwood available from tops of sawtimber trees amounts, approximately, to one-quarter cord of pine and one-half cord of hardwood per 1,000 board feet of pine and hardwood saw logs respectively; an equal proportion is available from trees removed in stand improvement, thus making a total cut of one-half cord of pine and one cord of hardwood to 1,000 board feet of pine and hardwood. Only 27 acres, or 37.5 percent of the entire 72 acres in the young stands of old field pine, are stocked sufficiently to need a thinning. If one-fifth of the total area in young stands, (14.4

acres) is covered the first year, then only 37.5 percent, (5.4 acres) is dense enough to thin. In order to liberate crop trees, which will make up future sawtimber cut, about one cord of fuelwood and 10 fence posts per acre will be cut as thinnings from

TABLE 12. -- *Volume and stumpage value of annual increment of sawtimber over 13 inches, d.b.h., in a farm woodland in the Meriwether sample area*

Class of stand	Area	Annual increment per acre				
		Volume		Value		
		Pine	Hardwood	Pine[1]	Hardwood[2]	Total
	Acres	*Board feet*[3]		*Dollars*		
Old field pine type:						
Sawtimber well-stocked	40	237		.59		.59
Sawtimber med. stocked	35	185		.46		.46
Sawtimber poorly stocked	13	97		.24		.24
Young well-stocked	27	15		.04		.04
Young med. stocked	21	17		.04		.04
Young poorly stocked	24	10		.02		.02
Pine hardwood type:						
Sawtimber	24	139	105	.35	.21	.56
Young	8	29	145	.07	.29	.36
Upland pine type:						
Sawtimber	7	120	39	.30	.08	.38
Young	11	4	60	.01	.12	.13
Bottomland hardwoods	20		50		.10	.10

[1] Pine stumpage at $2.50 per thousand board feet.
[2] Hardwood stumpage at $2.00 per thousand board feet.
[3] International 1/4-inch kerf rule.

Table 13. - Annual cut of sawtimber, fence posts and fuelwood on a farm woodland in the Meriwether sample area

Class of stand	Area cut	Sawtimber									Fuelwood		Fence posts	
		Volume				Stumpage value								
		Per acre		Total		Per acre		Total						
		Pine	Hdwd.	Pine	Hdwd.	Pine 1/	Hdwd 2/	Pine	Hdwd.	Total	Pine	Hdwd.	Pine	Hdwd.
	Acres	----- Board feet 3/ ----				---------- $ ----------					-- Cords --		--Number--	
Old field pine type: Sawtimber	17.6	1,035		18,218		2.59		45.55		45.55	9.1			
											5.4		54	
Young	14.4													
Pine hardwood	6.4	558	575	3,568	3,680	1.39	1.15	8.92	7.36	16.28	1.8	3.7		
Upland pine	3.6	246	259	884	933	.61	.52	2.21	1.87	4.08	.4	.9		
Bottomland hardwoods	4.0		250		1,000		.50		2.00	2.00		1.0		100
Total	46.0			22,670	5,613			56.68	11.23	67.91	16.7	5.6	54	100

1/ Pine stumpage at $2.50 per thousand board feet.
2/ Hardwood stumpage at $2.00 per thousand board feet.
3/ International 1/4" kerf rule.

the 5.4 acres. From the 4 acres in the bottomland hardwoods that are being cut for sawtimber, 25 hardwood fence posts per acre will be cut from low quality trees. This cut of fuelwood and fence posts can probably be maintained in future cuts. At present there is no market for pulpwood in this region; and because of the low value of fuelwood, the labor cost of producing it virtually equals its present sale value. The owner of this farm will use 12 of the 22 cords of fuelwood cut; he can sell the remaining 10 cords for about $2.00 per cord delivered. If he hires a wood cutter, he will come out even; but if he cuts and delivers the wood himself, he will receive $20.00 for his efforts.

The owner of this farm woodland can therefore place it under sustained yield management without spending any cash over and above his present expenditures. His annual taxes amount to about $0.14 per acre as usual; but his fire protection cost amounts to nothing more than an average of 3 days a year spent in fighting fires that threaten his property. By educating his neighbors concerning fire damage he can even reduce that cost.

Before cutting, the different classes of stands should be subdivided into 5 areas, each of about the same acreage, and boundaries should be blazed out. The cut for the first year would then be limited to one area in each class of stand. Subdividing will require of the farmer and his helper about three days' time. Three more days' time of two men, including two-thirds of a day with a truck, will be required to cut and haul 5.4 cords and 54 fence posts, the thinnings from 5.4 acres scattered over 14.4 acres. These thinnings should remove only the trees that are crowding out the previously selected crop trees, spaced from 10 to 15 feet apart. An additional day's work for two men will be required to cut and deliver the 100 hardwood posts from the bottomlands. Two men will need about two days to mark the trees for harvest and improvement cuttings, and to take an inventory of sawtimber trees on the 31.6 acres to be covered the first year. Technical help in marking can be obtained by applying to the State and Extension Foresters. The purchaser of the 28,283 board feet of stumpage will require approximately the following men, equipment, and time for logging and hauling: Two men felling and bucking for 7 days; one man and team loading for 7 days; and one man and truck hauling for 7 days. The farmer and his helper can then come in after the logging and cut the discarded tops, as well as the trees they intend to fell for improvement cuttings, into fuelwood; this work will require 5 days and will produce 16.9 cords of fuelwood. The two men will need two more days to deliver 10 cords to town and 6.9 cords to the farm house.

This farm has 17 acres of idle land, unfit for agriculture, which should be planted to loblolly, black locust, and a few miscellaneous species. It is proposed to plant one-fifth of the area, or 3.4 acres, during the first of the five years. Seedlings can be purchased from the State at about $2.00 per thousand. If planted about 6 x 7 feet, or 1,000 to the acre, the area will require 3,400 seedlings at a total cost of $6.80. To plant an acre with this spacing requires about 1.5 man-days, or 5.1 man-days for the 3.4 acres. The farmer can do this work himself. Table 14 shows the detailed possibilities of such a plantation.

The following outline shows the operations, with costs and incomes, which the owner will carry out in putting the farm woodland under sustained yield management.

1. Subdivision of woodland into 5 areas, one of which is to be cut each year.

   (*a*) Cost: 3 days' time of 2 men, or 6 man-days. This is not an annual requirement; it is done only once.
   (*b*) Income: None.

2. Inventory and marking of trees to be cut in the first cutting area of 31.6 acres.

(*a*) Cost: 2 days' time of 2 men, or 4 man-days.
(*b*) Income: None.

TABLE 14. -- *Costs and returns per acre from planting*

Date	Work	Cost	Stumpage returns
1935 or first year	Plant 1000 trees 6 x 7 feet in mixtures generally involving 400 black locust, 400 loblolly, and 200 miscellaneous, including shortleaf, red cedar, and yellow poplar.	Planting labor 1½ man-days; planting stock $2.	
1945 or tenth year	Survival is 80% and trees average 3 inches at d.b.h. Thin, leaving 500 trees per acre (200 locust, 200 loblolly pine, 100 miscellaneous).	1 man-day per acre.	
1955 or 20th year	Allowing for mortality and growth there will be 450 trees averaging 6 inches. Thin by removing the 180 remaining locust. 270 trees are left.		180 locust trees or 360 posts.
1965 or 30th year	Allowing for mortality and growth there will be 240 trees with an average size of 10 inches. Cut 140 trees leaving 100.		140 trees averaging 50 ft. b. m. per tree, or 7000 at $2.00 per M - $14.00.
1985 or 50th year	Allowing for mortality and growth there will be 90 trees with an average size of 17 inches. Cut 60 trees leaving 30.		60 trees averaging 270 ft. b. m. per tree, or 16,200 at $4.00 per M - $64.80.
1988 or 53rd year	Cut the remaining 30 trees averaging 18 inches. In last three years natural young growth will have become established at no cost.		30 trees averaging 310 ft. b. m. per tree, or 9,300 at $4.00 per M - $37.20
	Taxes for 53 years at $.14 per acre (without interest)	$7.42	
	Total in 53 years	$9.42	$116.00
	Net income per year (without interest)		$2.01

3. Sale of sawtimber stumpage from 31.6 acres.

   (*a*) Cost: None.
   (*b*) Income: 22,670 board feet of pine stumpage at $2.50 per thousand board feet; 5,613 board feet of hardwood stumpage at $2.00 per thousand board feet--a total cash income of $67.91.

4. Thinning of young stands on 14.4 acres of old field pine.

   (*a*) Cost: 3 days' time of 2 men, or 6 man-days; and use of a truck for two-thirds of a day.
   (*b*) Income: 5.4 cords of fuelwood used on the farm; 54 pine fence posts.

5. Improvement cuttings and cutting of tops into fuelwood on 31.6 acres.

   (*a*) Cost: 8 days' time of 2 men, or 16 man-days; and 2.5 days' use of truck.
   (*b*) Income: 10 cords of wood sold for $20.00 cash; 6.9 cords of wood used at the farm house; and 100 hardwood fence posts used on the farm.

6. Protection against fire of 230 acres of woodland and 17 acres of idle land to be planted to forest trees.

   (*a*) Cost: 3 days' time of 1 man fighting fire, or 3 man-days.
   (*b*) Income: None.

7. Planting of 3.4 acres of idle land annually for 5 years.

   (*a*) Cost: 3,400 seedlings at $2.00 per thousand - $6.80; 1.5 man-days per acre, or 5.1 man-days.
   (*b*) Income: No income for about 20 years, or until fence posts and fuelwood may be cut.

8. Payment of taxes on 230 acres of woodland and 17 acres of idle land to be planted to forest trees.

   (*a*) Cost: $0.14 per acre, a total of $34.58 per year.
   (*b*) Income: None.

Since the farmer and his family can do most of the work required to put the farm woodland under management, cash charges for labor need not be set up; on the other hand, since many of the products cut are used on the farm rather than sold, cash values need not be applied to them. The only cash costs are taxes, $34.58, and tree seedlings, $6.80; the cash incomes are stumpage, $67.91, and fuelwood, $20.00. The net cash income for the year considered is $87.91 less $41.38, or $46.53. The cost of gasoline and depreciation against the truck are also to be considered, but the farmer can often deliver his wood when making a necessary trip to town for another purpose.

If those annual activities of the owner that yield no income--such as fire protection (3 man-days valued at $6.00); marking and inventory work (4 man-days valued at $8.00); cutting and hauling the 10 cords of wood (time of men and truck valued at $20.00)--are charged against the income along with taxes and cost of pine seedlings, then the net income is $87.91 less $75.38, or $12.53. It must be remembered, however, that the farm woodland has now been put into condition for more volume and better quality growth. Unquestionably, the annual yield of stumpage from this for-

est can be increased at least three, probably four or more times in volume, and still more in value. If the farmer does his own logging and transports the logs to the sawmill, he will need 28 man-days of labor, 7 days' use of his team, and 7 days' use of a truck; but he can obtain about $6.00 per thousand board feet for logs delivered at the mill, or a total of $169.70 instead of $67.91, the present stumpage price.

In addition to these tangible values in timber products which the farm woodland provides, it also prevents serious erosion of land, serves as a pasture for live stock and a habitat for wild game, and has important recreational value.

Financial Possibilities of Subsistence Homestead Community Forests

A subsistence homestead project has been proposed for Jasper County, Georgia. A community forest has been considered as a part of this undertaking, and it is desirable to know the financial possibilities of such a forest. In order to illustrate these possibilities, a hypothetical 10,000-acre forest has been set up, which has the same proportion of forest types, classes of stands, and idle land suitable only for forests as were found in the Jasper County sample area (8,700 acres). The volumes, annual increment, and other forest data found in this unit have also been adopted. Cultivated land and idle land suitable for agriculture have not been considered for forests, since they will be used for cultivation.

This forest of 10,000 acres is made up of 8,670 acres of forests and 1,330 acres of idle land, which is potential forest land as it is unsuitable for agriculture. It consists of 5,980 acres of old field pine; 870 acres of pine and hardwoods that grow along the second bottoms of the larger streams and along branches; 780 acres of pine and hardwoods that grow on the ridges; and 1,040 acres of hardwoods in the bottom lands of the larger streams. The potential forest land consists of abandoned fields and pastures, which are unsuitable for agriculture because of erosion, steepness of slope, or poor soil quality.

The areas, volumes, and annual increment of sawtimber of each class of stand within the forest types are shown in table 15. (See pages 5 to 7 for definitions of forest types and classes of stand; stand tables for each class of stand are shown in tables 6 and 7). The total annual increment of sawtimber (trees over 13 inches, d.b.h.) in present stands is 707,330 board feet of pine and 352,210 board feet of hardwoods. It so happens that the present annual increments in the three classes of sawtimber stands in the old field pine type do not vary greatly because the heavier densities of the better stocked stands are in the small diameters, which do not enter into the sawtimber increment at present. The maximum annual increment in old field pine is 243 board feet per acre, and the maximum present volume of sawtimber is 2,852 board feet. Pine hardwood sawtimber stands have an annual increment of 122 board feet of pine and 96 board feet of hardwood per acre on a volume of 1,805 board feet of pine and 1,917 board feet of hardwoods. Upland pine sawtimber stands have an annual increment of 83 board feet of pine and 117 board feet of hardwoods per acre, and a volume of 2,584 board feet of pine and 2,343 board feet of hardwoods. Bottom hardwoods are growing 162 board feet on a volume of 3,236 board feet. Almost all stands are understocked in the sawtimber diameter classes, particularly the old field and open stands, and much of their volume is in poor quality timber that will saw out no better than Number 2 common boards.

To obtain an annual income and also to improve the stands so that they will yield a larger volume of higher quality material, it is desirable to cover the entire forest once each five years, making thinnings, improvement cuttings, and harvest cut-

Table 15. - Areas, volumes, and annual increment of sawtimber over 13", diameter breast height, in a community forest in Jasper county

Class of stand	Area	Volume				Annual increment			
		Per acre		Total		Per acre		Total	
		Pine	Hardwood	Pine	Hardwood	Pine	Hardwood	Pine	Hardwood
	Acres	Board feet							
Old field pine type:									
Sawtimber well stocked	880	2,852		2,509,760		203		178,640	
Sawtimber medium stocked	1,070	2,186		2,339,020		243		260,010	
Sawtimber poorly stocked	720	939		676,080		198		142,560	
Young well stocked	1,070	16		17,120		5		5,350	
Young medium stocked	1,140	30		34,200		6		6,840	
Young poorly stocked	1,100	16		17,600		7		7,700	
								601,100	
Pine hardwood type:									
Sawtimber	470	1,805	1,917	848,350	900,990	122	96	57,340	45,120
Young	400	454	1,396	181,600	558,400	38	70	15,200	28,000
								72,540	73,120
Upland pine type:									
Sawtimber	330	2,581	2,343	852,720	773,190	83	117	27,390	38,610
Young	450		3,196		1,438,200	14	160	6,300	72,000
								33,690	110,610
Bottomland hardwoods	1,040		3,236		3,365,440		162		168,480
Total forested	8,670			7,476,450	7,036,220			707,330	352,210
Potential forest land now idle	1,330								
Total	10,000								

tings. Approximately one-fifth of the forest should be covered each year, and, in order to distribute the work as evenly as possible over the five year period, approximately one-fifth of the area in each stand class should be included, but the area to be cut should be blocked up as nearly as possible into one unit. Before beginning the cut, the areas to be cut should be located on the ground and the trees should be marked for cutting. A map based on aeroplane pictures that shows forest stand classes for the entire county will be available within a year; it will be of great assistance in planning and locating the cut on the property.

The total annual cut of sawtimber on one-fifth of the forest should not exceed the total present annual increment of sawtimber on the whole property. Since much of the growing stock is below sawtimber size, a large part of which is approaching sawtimber size, it is permissible to cut this present annual increment. Along with the logging, a considerable volume of fuelwood can be cut from tops of sawtimber trees and from trees cut in stand improvement. For every 1,000 board feet of pine logs cut on this property, about one-quarter cord of fuelwood can be cut from tops and another one-quarter cord from trees cut in stand improvement. Twice these amounts can be cut, namely, one cord of fuelwood, per 1,000 board feet of hardwood logs. On every four acres of bottomland hardwood, about 100 fence posts can be obtained in addition to the fuelwood. Fence posts can be cut also in thinning young stands of old field pine, but only one acre out of every three is dense enough to need thinning. On those areas with dense stands it is estimated that one cord of fuelwood and ten pine fence posts per acre will be cut in thinning. Table 16 shows the areas, volumes, and stumpage values included in the first cut of sawtimber by forest types; the number of fence posts and cords of fuelwood that will be cut from tops and in improvement cuttings; the areas of young stands in old field pine to be thinned; and the number of fence posts and cords of fuelwood to be cut.

The total annual cut of sawtimber, which is also the present sawtimber increment, is 707,330 board feet of pine and 352,210 board feet of hardwoods. Since the present value of stumpage per thousand board feet is $2.50 for pine and $2.00 for hardwoods, the total value of pine stumpage is $1,768; that of hadwood stumpage, $704. But because one of the purposes of the subsistence homestead is to provide employment, it is not likely that this stumpage will be sold; probably it will be logged and manufactured into lumber by subsistence homesteaders, and possibly used by them in building homes, barns, and other necessary buildings. About 3 man-days of labor are required to produce 1,000 board feet of lumber; hence a total of 3,179 man-days would be required to cut the total volume. If the minimum lumber code wage of about $2.00 per day is paid, $6.00 per thousand board feet of lumber, or a total of $6,358 worth of labor, will have been provided. Wages make up about 50 percent of the total lumbering costs; if a sum approximately equal to the cost of labor is added for trucks, teams, depreciation of plants, and other overhead costs, the cost of the lumber before adding stumpage costs is $12.00 per thousand, or $12,715 total. The addition of the present current stumpage value of $2,472 brings the total cost of the lumber to $15,187, which is approximately $14.33 per thousand board feet.

Subsistence homestead farmers will also cut 706 cords of fuelwood and 5,200 fence posts from tops and from trees removed in improvement cuttings. Two men can cut approximately 3 cords of fuelwood or 150 fence posts per day, and 2 men with a truck can haul about 10 cords of fuelwood or 500 fence posts per day from the woods to the farm houses. To cut 706 cords of fuelwood, 471 man-days of labor are necessary; to cut 5,200 fence posts, 69 additional man-days are required. The hauling of fuelwood and fence posts combined consumes 162 man-days, 141 for the fuelwood and 21 for the posts. The total man-days of labor necessary for cutting and hauling amount to 702; at $2.00 per day, they represent $1,404 wages.

Table 16. - Annual cut of sawtimber, fence posts and fuelwood on a community forest in Jasper County

Class of stand	Area cut	Sawtimber									Fuelwood		Fence posts	
		Volume				Stumpage value								
		Per acre		Total		Per acre		Total						
		Pine	Hdwd.	Pine	Hdwd.	Pine 1/	Hdwd 2/	Pine	Hdwd.	Total	Pine	Hdwd.	Pine	Hdwd.
	Acres	Board feet 3/				$					--Cords--		--Number--	
Old field pine sawtimber	534	1,126		601,100		2.82		1,502.75		1,502.75	301			
Old field pine young	662										221		2,210	
Pine hardwoods sawtimber and young	174	417	420	72,540	73,120	1.04	.84	181.35	146.24	327.59	36	73		
Upland pine sawtimber and young	156	216	709	33,690	110,610	.54	1.42	84.22	221.22	305.44	17	111		
Bottomland hardwoods	208		810		168,480		1.62		336.96	336.96		168		5,200
Total	1,734			707,330	352,210			1,768.32	704.42	2,472.74	575	352	2,210	5,200

1/ Pine stumpage at $2.50 per thousand board feet.
2/ Hardwood stumpage at $2.00 per thousand board feet.
3/ International 1/4" kerf rule.

The cutting and hauling of 221 cords of fuelwood and 2,210 pine fence posts removed in thinning 662 acres requires 229 man-days, 191 for the fuelwood and 38 for the posts; at $2.00 per day, this work involves a labor value of $458. To cut and haul a cord of fuelwood costs about $2.00--$1.33 labor cutting, $0.40 labor hauling, and $0.27 cost of the truck; the same cost for 100 fence posts is $4.00, or $2.67 labor cutting, $0.80 labor hauling, and $0.53 cost of the truck. For cutting and hauling fuelwood and fence posts in this community forest, the farmers will probably be reimbursed with fuelwood and fence posts at the cost price rate of $2.00 per cord for fuelwood and $4.00 per 100 fence posts.

Man-days required to cut lumber, fence posts, and fuelwood in harvest, improvement, and thinning cuttings during the first year total 4,110; the value of this labor is $8,220. Table 17 shows the distribution of labor in man-days, value of labor, other costs, stumpage values, and amount of forest products cut by operations. Although the lumber could probably be sold for an average price of $18.00 or $20.00 per thousand board feet, it would doubtless be good policy to sell it to the homesteaders at cost, $14.33 per thousand board feet, allowing credit for such labor as they contribute. The other forest products could be sold on the open market for about the cost of production, but they will probably be exchanged for labor contributed. The only net income from the forest with which to meet taxes, administrative costs, and other expenses is the stumpage value of the sawtimber cut--$2,472. Spreading this over 10,000 acres gives an annual income of about $0.25 per acre per year.

The annual costs on this community forest are for taxes, fire protection, inventory and marking, administration, and planting. No costs for roads or other improvements are included because it is understood that the county and state will bear costs of roads, and that workers on the forest will be housed on their subsistence homestead farms. Table 18 shows the forest's annual cost per acre and the total annual cost of the various items of expense. Taxes in this county amount to $0.08 per acre; the average cost of fire protection is $0.05 per acre. Possibly this forest can

TABLE 17. -- *Man-days, wages, stumpage values, and other costs of producing lumber, fuelwood, and fence posts on a community forest in Jasper County, Georgia*

Operation	Products	Amount	Man-days required	Value of labor	Other costs	Stumpage value
			Number	----------	*Dollars*	----------
Logging and manufacturing	Pine lumber	707,330 *bd. ft.*	2,122	4,244	4,244	1,768 [1]
	Hdwd. lumber	352,210 *bd. ft.*	1,057	2,114	2,113	704 [2]
Improvement cutting and cutting of tops	Fuelwood	706 *cords*	612	1,224	188	0
	Fence posts	5,200 *pieces*	90	180	28	0
Thinning	Fuelwood	221 *cords*	191	382	60	0
	Fence posts	2,210 *pieces*	38	76	12	0
Totals			4,110	8,220	6,645	2,472

[1] Pine stumpage at $2.50 per thousand board feet.

[2] Hardwood stumpage at $2.00 per thousand board feet.

be organized with other land into a protection unit under the administration of the State Forester; if so, the community forest would be charged only half of this protection cost. The inventory and marking would cover only that part of the forest to be cut over, 1734 acres, and would include only those trees over 13 inches (d.b.h.). The cost would average about $0.20 per acre. General administration of the forest, which would be a part of that of the whole subsistence homestead, amounts to $0.02 per acre. The planting of one-tenth of the idle land, 133 acres, for each of 10 years would cost about $5.00 per acre, including cost of seedlings and wages. The total annual cost is $2,512, or approximately $0.25 per acre. This cost closely approximates the value of the stumpage cut, which is $2,472, based upon the current stumpage values of pine and hardwood at $2.50 and $2.00 per thousand board feet respectively. Five hundred and forty man-days of labor would be provided by the different cost items during the year: Fire protection, 200; inventory and marking, 100; administration, 40; and planting, 200.

As shown in the preceding paragraphs, the incomes and costs during the first few years on the community forest will show neither profit nor loss. Although there will be no surplus representing interest on the value of the forest investment, an annual total of 4,650 man-days of labor will be furnished; 1,060,000 board feet of lumber, 927 cords of fuelwood, and 7,410 fence posts will be produced and sold at cost to subsistence homesteaders for their home use. Meanwhile the forest will have been put in better growing condition, so that a future yield of greater volume, higher quality, and more valuable products can be expected. Unquestionably, the annual yield of stumpage from this forest can be increased at least three, probably four or more times in volume, and still more in value.

In addition to the money values of the forest's products, its value in preventing soil from washing away is considerable. Other important forest possibilities include the propagation of fish and game as an item of food for the homesteaders, the grazing of live stock and dairy cattle, and recreation.

TABLE 18. -- *Annual costs on a community forest in Jasper County, Georgia*

Item	Acres covered	Man-days required	Cost	
			Per acre	Total
		Number	*Dollars*	
Taxes	10,000		.08	800.00
Fire protection	10,000	200	.05	500.00
Inventory and marking	1,734	100	.20	347.00
Administration	10,000	40	.02	200.00
Planting	133	200	5.00	665.00
		540		2,512.00

USE OF FORESTS FOR SOIL PROTECTION, GAME MANAGEMENT, RECREATION, AND GRAZING

Use of Forests for Soil Protection

The actual returns from a forest are more than the yields in wood products. Soil protection and soil reconstruction, fish and game production, recreation, and grazing of live stock are some of the other uses of a forest from which either direct or indirect returns are received.

Among the most important uses of the forests in the Lower Piedmont Region are the protection of soil against erosion and the reconstruction of soil that has been badly washed by sheet and gully erosion. Since such a large part of the abandoned land has been eroded and so much of it has reverted to forests, a study was made of the effects of forests in checking erosion. Records of active and arrested erosion were taken on 924 one-quarter acre forest plots in old field pine stands and on 512 forests plots in natural forest stands other than old field. About 4 percent of all forest plots showed active or unarrested erosion. In the old field pine forests of the six sample areas, 5.3 percent of the plots showed active erosion as compared to only 1.4 percent of the plots in the other types. The investigation showed, as was expected, that active erosion is found mostly in the young timber and in the poorly stocked stands. Undoubtedly, these young stands will in time arrest the active erosion. Some plots that showed active erosion lay just below large fields that drained through the forest plot, the drainage resulting in active gullying. Fire, which burns off the pine needles and other vegetative cover, frequently opens the area to sheet erosion.

Forest plots with arrested erosion were classified in the following four groups, depending on the degree of erosion which, though arrested, was still apparent: Sheet #1 - no apparent erosion, or mild sheet erosion with less than 30 percent of the B soil horizon exposed; sheet #2 - serious sheet erosion with more than 30 percent of the B soil horizon exposed; gully #1 - occasional gullies; gully #2 - heavily gullied area unfit for agriculture. In old field pine, 94.7 percent of the forest plots showed arrested erosion, divided as follows among the four grades of erosion: Sheet #1, 40.3 percent; sheet #2, 16.5 percent; gully #1, 29.0 percent; and gully #2, 8.9 percent. In other than old field forests, 98.6 percent of the forest plots showed arrested erosion, divided as follows: Sheet #1, 87.3 percent; sheet #2, 2.5 percent; gully #1, 7.8 percent; and gully #2, 1.0 percent. Table 19 shows these erosion conditions by classes of stands for the six sample areas as a whole; table 20 shows erosion conditions for each of the six sample units. On areas with arrested erosion, the trees and other vegetation are gradually rebuilding a fertile layer of top-soil upon the impoverished soils they reclai m.

An interesting contrast of soils was found in Jasper County near Monticello. A natural forest that never had been cleared had a layer of top soil, or A horizon soil, about 12 inches deep. At the edge of the forest the A horizon disappeared abruptly with the beginning of the adjoining cultivated field where sheet erosion was active.

With an Abney hand level, the slope was ascertained for almost all plots on the line plot survey. The forest plots were then classified into the following slope-percent classes: 0-3 percent, 3 to 7 percent, 7 to 12 percent, and over 12 percent. Table 21 shows the relationship between the degree of slope and class of erosion and the class of stand. Slope data for the old field pine type, taken on 918 plots, are distributed as follows: 10.8 percent of the areas had slopes of 3 percent or less;

43.2 percent had slopes between 3 and 7 percent; 30.6 percent had slopes between 7 and 12 percent; and 15.4 percent had slopes over 12 percent. Ordinarily, as shown in the old field pine plots in the different slope classifications, the steeper the degree of slope, the greater the erosion has been in the past. Eighty percent of the old field pine plots having the steepest slopes (12 percent and over) showed evidence of serious sheet or gully erosion in the past, whereas only 3 percent of the plots on gentle slopes showed signs of serious erosion now arrested.

TABLE 19. -- *Percent of forest plots with active and arrested erosion by classes of forest stands for the six sample areas as a whole*

Class of stand	Active erosion	Erosion arrested				Total	Number of plots
		Sheet #1[1]	Sheet #2	Gully #1	Gully #2		
		Percent of total					
Old field pine type:							
Sawtimber well stocked	1.3	39.6	14.3	31.2	13.6	100	154
Young well stocked	5.9	46.1	20.4	21.7	5.9	100	152
Sawtimber medium stocked	2.0	29.8	17.2	36.4	14.6	100	198
Young medium stocked	11.3	44.4	15.0	25.6	3.7	100	133
Sawtimber poorly stocked	1.7	39.0	18.6	33.9	6.8	100	118
Young poorly stocked	10.0	45.6	14.2	24.3	5.9	100	169
Averages and total	5.3	40.3	16.5	29.0	8.9	100	924
Pine hardwood type:							
Sawtimber	1.9	89.8	.9	7.4		100	108
Young	2.1	81.1	2.1	14.7	1.0	100	95
Upland pine type:							
Sawtimber		78.6	7.1	10.7	3.6	100	84
Young	2.7	83.5	3.7	9.2	.9	100	109
Bottomland hardwood pine type:		100.0				100	116
Averages and total	1.4	87.3	2.5	7.8	1.0	100	512

[1] Sheet No.1 includes plots with no apparent erosion or with mild sheet erosion.

TABLE 20. -- *Percent of forest plots with active and arrested erosion in each of the six sample areas*

Sample areas	Active erosion	Erosion arrested				Total	Number of plots
		Sheet #1	Sheet #2	Gully #1	Gully #2		
		Percent of total					
Old field pine type:							
Jasper	6.6	44.8	14.8	26.2	7.6	100	183
Monroe	5.5	31.3	23.1	29.1	11.0	100	182
Wilkes A.	4.1	61.0	13.7	15.7	5.5	100	146
Wilkes P.	1.7	48.3	14.6	34.5	.9	100	116
Meriwether	5.1	38.7	7.4	36.9	11.9	100	176
Morgan	8.3	16.5	28.1	32.2	14.9	100	121
Averages and total	5.3	40.3	16.5	29.0	8.9	100	924
Other than old field pine type:							
Jasper	2.5	80.2	2.5	13.6	1.2	100	81
Monroe		89.4	3.2	7.4		100	94
Wilkes A.		87.6	2.5	9.9		100	81
Wilkes P.	2.7	84.9	5.5	6.9		100	73
Meriwether	2.3	92.0		5.7		100	88
Morgan	1.1	88.4	2.1	4.2	4.2	100	95
Averages and total	1.4	87.3	2.5	7.8	1.0	100	512

FISH AND GAME PRODUCTION AND RECREATION

The propagation of fish and game, which does not interfere with other uses of the forest, can be made an important part of the management of forests in the Lower Piedmont Region. Most streams are already fairly well stocked with fish, and the land supports numerous rabbits, squirrels, quail, raccoon and opossum. Fish and game now constitute a part of the food used by the population, and this free food could be considerably increased.

The most important management measures are those designed to protect fish and game through strict observance of fishing and hunting seasons and through the limitation of the catch or kill. People in this region are more interested in fish and game for food than for sport (although the latter is important); hence the propagation of food fish, such as channel-cat, red-horse, drum, and buffalo, should be encouraged in the streams and ponds, along with such game as rabbits, squirrels, quail, and opossum in the forest. The sale of hunting and fishing rights also affords an opportunity of obtaining a cash income from game management; but before this is possible, game fish, such as black bass, and wild game, such as quail, wild turkey, deer, and valuable fur bearing animals, must be stocked. Both food and game fish may be propagated, but in general it may be expedient to allot a separate area for each. The practicability

Table 21. - Erosion conditions in the old field pine type by stand classes and degree of slope for the six sample units considered as a whole
Basis 918 plots

Class of stand	Slope 0-3 percent						Slope 3-7 percent					
	Active erosion	Erosion checked				Total	Active erosion	Erosion checked				Total
		Sheet #1	Sheet #2	Gully #1	Gully #2			Sheet #1	Sheet #2	Gully #1	Gully #2	
	Percent of total											
Old field pine type:												
Sawtimber well stkd.		7.3				7.3		24.5	4.0	11.9	2.0	42.4
Young well stkd.		17.2				17.2	2.0	23.8	11.9	10.6	.7	49.0
Sawtimber med. stkd.		7.7				7.7	.5	17.3	5.6	12.8	1.0	37.2
Young med. stkd.		9.8	.8	.7		11.3	5.2	28.6	8.3	12.8	.7	55.6
Sawtimber poorly stkd.		9.3				9.3	.9	19.5	5.1	11.0	.8	37.3
Young poorly stkd.		11.8	.6			12.4	4.7	23.1	1.8	10.0	.6	40.2
Percent of grand total		10.5	.2	.1		10.8	2.2	22.5	6.0	11.5	1.0	43.2
Percent of individual slope totals		97.0	2.0	1.0		100.0	5.0	52.1	13.9	26.7	2.3	100.0

Class of stand	Slope 7-12 percent						Slope 12 percent and over					
	Active erosion	Erosion checked				Total	Active erosion	Erosion checked				Total
		Sheet #1	Sheet #2	Gully #1	Gully #2			Sheet #1	Sheet #2	Gully #1	Gully #2	
	Percent of total											
Old field pine type:												
Sawtimber well stkd.	.7	6.6	8.6	10.6	5.3	31.8	.7	1.3	2.0	8.6	5.9	18.5
Young well stkd.	2.0	5.3	6.0	10.6	2.6	26.5	1.3		2.7	.7	2.6	7.3
Sawtimber med. stkd.		3.6	8.7	16.8	6.1	35.2	1.5	1.5	[illegible]	[illegible]	7.7	19.9
Young med. stkd.	4.5	5.3	3.0	11.3	.7	24.8	1.5	.7	3.0	.8	2.3	8.3
Sawtimber poorly stkd.	.9	7.6	7.6	15.3	2.5	33.9		2.6	5.9	7.6	3.4	19.5
Young poorly stkd.	2.4	7.7	7.1	11.2	1.8	30.2	3.0	3.0	4.7	3.0	3.5	17.2
Percent of grand total	1.6	5.9	7.0	12.7	3.4	30.6	1.4	1.5	3.5	4.5	4.5	15.4
Percent of individual slope totals	5.4	19.2	22.8	41.6	11.0	100.0	9.2	9.9	22.7	29.1	29.1	100.0

and profitableness of game management have been demonstrated in southern Georgia and northern Florida, where large tracts have been leased to hunting clubs. On other tracts a fee for hunting is charged. Valuable assistance in game management may be obtained by cooperating with such public agencies as the Georgia State Fish and Game Department, the Georgia Forest Service, the United States Biological Survey, and the United States Bureau of Fisheries.

Except for fishing and hunting, the forests of this region will scarcely be used extensively for recreation. The streams are mostly unsatisfactory for swimming, and the climate is not conducive to summer camping.

Grazing

Individual farmers use the forests and idle land as a range for a few livestock. Grazing, however, is not a large industry in this region and probably will not be of much importance in the future. As forests claim the idle land, and as stocking becomes heavier under fire protection and forest management, the value of the forest as a range for cattle and other livestock wil lbecome less and less.

SUMMARY

The Lower Piedmont Region of Georgia includes 35 counties located just north of the fall line in the central part of the state. More than four-fifths of the region has been cleared at one time or another, but owing to the inroads of the boll weevil and the destructive methods of cultivation that have resulted in serious erosion of the soil, a large part of the total area has been abandoned from cultivation and has reforested to old field pine. Approximately 56 percent of the area was in woodland in 1930, and 43 percent was in cleared land; but only half the cleared land yielded harvest crops. About 40 percent of the cleared land (17 percent of the total area of the region) was idle, and 70 percent of this idle land (12 percent of the total region) was unfit for agriculture. Slightly more than two-thirds of the forested area was in old field pine stands, about 10 percent was in ridge stands of upland pine and hardwoods, 11 percent was in branch head and second bottom pine and hardwoods, and 11 percent was in bottomland hardwoods. Owing chiefly to the heavy cutting of salable timber by farmers who needed a cash income to supplement their diminished crop incomes, most timber stands are poorly stocked with sawtimber trees. Stands are also commonly understocked as to total number of trees. The quality of timber is accordingly poor, resulting in a small annual increment of sawtimber and low stumpage values. The financial possibilities at present are not very attractive, but with management these forests should yield much better returns as well as a satisfactory profit.

In January 1934, 220 small sawmills in this region were allotted production quotas under the Lumber Code totaling 14,128,000 board feet of lumber and involving 42,384 man-days of employment per month. A concentration yard with a planing mill and small portable mills scattered in the better patches of timber is the common set-up for lumbering. "Roofers", which sell for about $20.00 per thousand board feet, are the chief product. About three 8-hour man-days are required to log and mill 1,000 board feet of lumber.

A farm in Meriwether County illustrates the financial possibilities of farm woodlands. It has 230 acres of forested land of the following classes: Old field

pine, 160 acres; upland pine and hardwoods, 18 acres; branch head and second bottom pine and hardwoods, 32 acres; bottomland hardwoods, 20 acres. In addition, it has 17 acres of idle land, unsuited to agriculture, which should be planted to forest trees. The per-acre volumes and present annual increment of the well stocked old field pine stands are 3,339 and 237 board feet respectively; those of poorly stocked stands are 1,435 and 97 board feet respectively. The present current per-acre stumpage values of the annual increment in well stocked and poorly stocked stands are $0.59 and $0.24 respectively. The total annual increment of sawtimber on the farm is 22,670 board feet of pine and 5,613 board feet of hardwoods; and the total value of this increment, which is also the allowable cut, is $67.91, or $0.30 per are of forested area. In addition to sawtimber, 22 cords of fuelwood and 154 fence posts can be cut from the tops of felled sawtimber trees and from the trees removed in making improvement cuttings and thinnings. The farmer will need the fence posts and about 12 cords of the fuelwood for use on the farm, but he can sell the other 10 cords for $20.00 cash. The annual costs of forest management for the farm woodland are: $0.14 per acre, or $32.20 for 230 acres, as a cash payment for taxes; 3 man-days' labor in fire protection; 26 man-days in improvement cuttings, thinning, and marking for harvest cutting. The cost per acre of planting the idle land is $2.00 for planting stock and 1½ man-days' labor in planting.

A study of financial possibilities of present stands on a 10,000 acre subsistence homestead community forest--- on which the homesteaders furnish all labor for forestry activities, logging and manufacturing; pay, in addition to their contributed labor, the current stumpage value for the timber utilized; and receive in return the forest products---showed that incomes and expenses would balance. The forest products making up the annual cut are: 707,330 board feet of pine lumber; 352,210 board feet of hardwood lumber; 2,210 pine fence posts; 5,200 hardwood fence posts; 575 cords of pine fuelwood; and 353 cords of hardwood fuelwood. The total value of the stumpage, with pine at $2.50 and hardwood at $2.00 per thousand board feet, is $2,472, or $0.25 per acre. The annual costs of forest management and of producing forest stumpage are: $0.08 per acre, or $800 for taxes; $0.05 per acre, or $500 for fire protection; $665 for planting stock and labor to plant 133 acres; $0.20 per acre, or $347 for inventory and marking the annual cut on 1,734 acres; $0.02 per acre, or $200 for administration; a total of $2,512 or $0.25 per acre. A total of 4,650 man-days of labor will be furnished annually to subsistence homesteaders in management activities and in manufacturing forest products.

The plots taken in this study indicate very little active erosion in the forest, even though much of the forest is old field pine that has reestablished itself upon seriously eroded field. The forest's ability to arrest soil erosion is therefore evident; only 5.3 percent of the old field pine stands and 1.4 percent of the natural forest stands other than old field showed active erosion. It was found also in old field pine stands that 10.8 percent of the areas had slopes less than 3 percent, 43.2 percent had slopes between 3 and 7 percent, 30.6 percent had slopes between 7 and 12 percent, and 15.4 percent had slopes greater than 12 percent. Eighty percent of the old field pine stands with slopes greater than 12 percent showed evidence of serious erosion in the past, whereas only 3 percent of the areas on gentle slopes showed signs of serious erosion.

The possibilities of using the forest for fish and game production, recreation, and grazing are also worthy of consideration.

APPENDIX

TABLE 1. -- *General distribution of land area by major use classes. Lower Piedmont Region, based on 1930 Agriculture census*

County	Total land area	Agricultural land	Urban areas	Forested land
Baldwin	196,480	67,459	2,305	126,716
Butts	129,920	66,307	2,167	61,446
Clarke	72,960	42,700	3,818	26,442
Clayton	90,880	51,570	1,868	37,442
Columbia	224,000	72,821	1,487	149,692
Coweta	283,520	134,651	5,926	142,943
Elbert	231,040	116,136	3,626	111,278
Fayette	149,760	62,825	1,466	85,469
Greene	266,240	96,796	2,850	166,594
Hancock	339,200	107,807	2,694	228,699
Harris	320,640	97,312	1,623	221,705
Hart	167,040	103,909	2,268	60,863
Henry	207,360	117,245	2,683	87,432
Jasper	205,440	98,547	3,016	103,877
Jones	241,280	95,273	1,832	144,175
Lamar	117,760	61,143	844	55,773
Lincoln	186,240	55,719	1,570	128,951
McDuffie	183,680	65,053	1,518	117,109
Meriwether	317,440	164,281	5,233	147,926
Monroe	300,800	94,967	3,116	202,717
Morgan	249,600	99,429	3,303	146,868
Newton	167,680	92,594	4,135	70,951
Oconee	110,080	66,036	1,513	42,531
Oglethorpe	322,560	127,545	2,628	192,387
Pike	151,680	82,554	3,373	65,753
Putnam	231,040	74,099	1,546	155,395
Rockdale	76,160	48,592	1,112	26,456
Spalding	133,760	76,646	3,372	53,742
Talbot	199,680	82,363	2,562	114,755
Taliaferro	135,680	53,799	875	81,006
Troup	278,400	119,842	6,706	151,852
Upson	202,880	83,726	2,567	116,587
Walton	211,840	130,703	3,639	77,498
Wilkes	293,120	113,134	3,129	176,857
Warren	258,560	104,136	1,714	152,710
Total	7,254,400	3,127,719	94,084	4,032,597
Percent of total	100.0	43.1	1.3	55.6

TABLE 2. -- *Height growth and mortality in plantations in the Lower Piedmont Region*

No.	Species	Year planted (Spring)	Average height May 1933	Maximum height May 1933	Area	Estimated survival May 1933	Notes[1]
			Feet	*Feet*	*Acres*	*Percent*	
a	Loblolly pine	1931	4	5	1	90	Eroded old field. Slope over 12%.
b	"	1931	3	4	1	95	Eroded old field.
c	"	1931	2½	4	10	95	Eroded old field. Slope 20%.
d	"	1930	5	7	1	95	Planted with alternate rows of cowpeas.
e	"	1930	4	6	1	98	Eroded abandoned pasture. Slope 7-12%.
f	"	1933	½	1½	3	98	Dry sandy old field. Slope 7-12%.
g	"	1927	19	21	1	95	Planted 6 x 8 feet on fair site.
h	"	1929	8	12	10	95	Poor soil. Gully slope over 12%.
i	"	1929	8	13	1	95	Fair, level site. Spacing 6 x 6 feet.
j	"	1930	7	11	1	95	Fair level site.
k	"	1929	3½	5	3	90	Fair level site.
k (1)	"	1929	4½	9	3		Direct seeding excellent stand caught on fair site. Pine straw added.
k (2)	"	1933					Direct seeding apparently a failure.
l	"	1930	3	5	1	92	Tip moth damage. Planted 3 x 4 feet.
m	"	1928	6	11	3	85	Poor site, crowded spacing, 3 x 4 feet.
n	"	1930	3	8	1	75	Good level site. Spacing 6 x 8 feet. Tip moth damage.
o	"	1931	2½	3	40	80	Poor steep site. Dense vegetation.
a	Slash pine	1931	2½	4	20	95	Poor old field site. Slope over 12%.
b	"	1931	3	4	3	90	Poor dry old field site. Slope over 12%.
c	"	1931	3	4	2	95	Poor, gullied slope.
d	"	1931	2½	3½	10	95	Eroded, clay soil. Slope over 15%, spacing 6 x 8 feet.
e	"	1931	3	4½	20	65	Mountainous site. Rocky and dry. Slope over 12%.
f	"	1931	2½	4	7	72	Dry sandy site. Spacing 6 x 8 feet.
g	"	1931	4	6	8	85	Fair site. Slope 3-7%, spacing 6 x 10 feet.
h	"	1931	2	3	10	50	Poor site. Vegetation dense.

TABLE 2. -- *Height growth and mortality in plantations in the Lower Piedmont Region*--Continued

No.	Species	Year planted (Spring)	Average height May 1933	Maximum height May 1933	Area	Estimated survival May 1933	Notes [1]
			Feet	*Feet*	*Acres*	*Percent*	
a	Longleaf pine	1928	4	8	10	90	Good site, spacing 6 x 8 feet.
b	"	1932	2	3½	10	90	Good site. Slope 5%. Spacing 7 x 7.
c	"	1931	1	2	7	85	Poor, eroded site. Spacing 8 x 8.
d	"	1929	3	6	10	70	Poor mountainous site. Slope 10%.
e	"	1931	1	2	1	50	Fair site.
f	"	1931	½	1	100	25	Poor, badly eroded site. Dense vegetation.
a	(Red cedar	1932	3	4	1	90	Old eroded field. Slope over 12%.
	(Black locust	1932	3	4		90	
b	(Tulip poplar	1932	1½	3	1	75	Fair site. Vegetation dense.
	(Loblolly	1931	4	5		90	
c	(Slash	1931	2½	3½	1	95	Eroded hillside old field.
	(Loblolly	1931	2½	3½		95	
d	(Slash	1931	2½	4	10	95	Old field eroded slope. Vegetation dense.
	(Loblolly	1931	2½	4			
e	Black locust	1923	27	40 [2]	1	98	Crowded in planting 6 x 6. Fair site. Damaged by vines.
f	Black locust	1931	7	13	3	90	Poor mountainous site.

[1] All except two of the plantations were established by planting seedlings; the exceptions were direct seedlings.

[2] The maximum diameter 4-1/2 feet above ground is 6 inches and some of the trees are large enough to yield 3 or 4 small fence posts of excellent quality.